

# **INSTALLATION RESTORATION PROGRAM (IRP) SITE INVESTIGATION**

## **VOLUME I**

**254th COMBAT COMMUNICATIONS GROUP and  
221st COMBAT COMMUNICATIONS SQUADRON  
TEXAS AIR NATIONAL GUARD  
GARLAND AIR NATIONAL GUARD STATION  
GARLAND, TEXAS**

**APRIL 1995**

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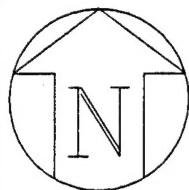


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APRIL 1995

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Site Investigation Report, Volume I A Site Investigation was performed at one site at the 254th Combat Communication Group and the 221st Combat Communication Squadron, Garland, Texas. The site investigated was the Station Drainage Area and Fence Line (referred to as Site 1). All contamination identified at the site was below State cleanup levels.				
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# **INSTALLATION RESTORATION PROGRAM (IRP) SITE INVESTIGATION**

## **VOLUME I**

**254th Combat Communications Group and  
221st Combat Communications Squadron  
TEXAS AIR NATIONAL GUARD  
GARLAND AIR NATIONAL GUARD STATION  
GARLAND, TEXAS**

**APRIL 1995**

*Prepared For*  
**NATIONAL GUARD BUREAU  
ANDREWS AFB, MARYLAND**

*Prepared By*      DTIC QUALITY INSPECTED 3  
**Operational Technologies Corporation  
4100 N.W. Loop 410, Suite 230  
San Antonio, Texas 78229-4253  
(210) 731-0000**

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**Site Investigation Report  
254th CCGP and 221st CCSQ, Garland ANGS  
Garland, Texas**

**TABLE OF CONTENTS**

**VOLUME I**

	<b>Page</b>
<b>LIST OF FIGURES . . . . .</b>	v
<b>LIST OF TABLES . . . . .</b>	vii
<b>LIST OF ACRONYMS . . . . .</b>	ix
<b>EXECUTIVE SUMMARY . . . . .</b>	ES - 1
<b>SECTION 1.0 INTRODUCTION . . . . .</b>	1 - 1
1.1 INSTALLATION RESTORATION PROGRAM . . . . .	1 - 1
1.1.1 Preliminary Assessment (PA) . . . . .	1 - 3
1.1.2 Site Investigation (SI) . . . . .	1 - 3
1.1.3 Remedial Investigation (RI) . . . . .	1 - 4
1.1.4 Feasibility Study (FS) . . . . .	1 - 5
1.1.5 Remedial Design (RD) . . . . .	1 - 6
1.1.6 Remedial Action (RA) . . . . .	1 - 6
1.1.7 Immediate Action Alternatives . . . . .	1 - 6
<b>SECTION 2.0 FACILITY BACKGROUND . . . . .</b>	2 - 1
2.1 FACILITY HISTORY . . . . .	2 - 1
2.1.1 Adjacent Land Use . . . . .	2 - 1
2.1.2 Waste Disposal Practices . . . . .	2 - 1
2.1.3 Previous Investigations . . . . .	2 - 4
2.1.3.1 Previous IRP Investigations . . . . .	2 - 4
2.1.3.2 Other Investigations . . . . .	2 - 4
2.2 SITE DESCRIPTION . . . . .	2 - 4
2.2.1 Site No. 1 (Station Drainage Area and Fence Line) . . . . .	2 - 4
2.2.2 Site History . . . . .	2 - 6
2.2.3 Potential Release Sources . . . . .	2 - 6
<b>SECTION 3.0 ENVIRONMENTAL SETTING . . . . .</b>	3 - 1
3.1 PHYSIOGRAPHY . . . . .	3 - 1
3.2 CLIMATE . . . . .	3 - 1
3.3 GEOLOGY . . . . .	3 - 1
3.3.1 Regional . . . . .	3 - 1
3.3.2 Local . . . . .	3 - 5
3.4 SOILS . . . . .	3 - 5
3.5 HYDROGEOLOGY . . . . .	3 - 7

**Site Investigation Report**  
**254th CCGP and 221st CCSQ, Garland ANGS**  
**Garland, Texas**

**TABLE OF CONTENTS (Continued)**  
**VOLUME I**

	<b>Page</b>
3.6 SURFACE WATER .....	3 - 7
<b>SECTION 4.0 FIELD PROGRAM .....</b>	<b>4 - 1</b>
4.1 SUMMARY .....	4 - 1
4.2 DEVIATIONS FROM THE WORK PLAN .....	4 - 1
4.3 FIELD SCREENING ACTIVITIES .....	4 - 2
4.3.1 Field Sample Preparation .....	4 - 3
4.3.2 Equipment Calibration .....	4 - 3
4.3.2.1 Field GC .....	4 - 3
4.3.2.2 Photoionization Detector .....	4 - 4
4.4 CONFIRMATION ACTIVITIES .....	4 - 4
4.4.1 Soil Borings .....	4 - 4
4.4.2 Specific Media Sampling .....	4 - 5
4.4.2.1 Soil .....	4 - 5
4.4.2.2 Quality Control of Field Sampling .....	4 - 6
4.4.2.3 Sample Preservation .....	4 - 6
4.5 INVESTIGATION DERIVED WASTE .....	4 - 6
<b>SECTION 5.0 INVESTIGATION FINDINGS .....</b>	<b>5 - 1</b>
5.1 BASE-WIDE GEOLOGIC AND HYDROGEOLOGIC INVESTIGATION RESULTS .....	5 - 1
5.2 BACKGROUND SAMPLING RESULTS .....	5 - 1
5.2.1 Background Sampling Locations .....	5 - 1
5.2.2 Background Sampling .....	5 - 1
5.2.2.1 Soil Sampling Results .....	5 - 1
5.3 SITE NO. 1 FINDINGS .....	5 - 6
5.3.1 Geologic and Hydrologic Results .....	5 - 6
5.3.2 Screening Results .....	5 - 7
5.3.3 Soils .....	5 - 7
5.3.3.1 Soil Boring Locations .....	5 - 8
5.3.3.2 Nature and Extent of Soil Contamination .....	5 - 8
5.3.3.2.1 Metals Contamination .....	5 - 12
5.3.3.2.2 VOCs Contamination .....	5 - 12
5.3.3.2.3 SVOCs Contamination .....	5 - 18
5.4 CONCLUSIONS .....	5 - 20

**Site Investigation Report  
254th CCGP and 221st CCSQ, Garland ANGS  
Garland, Texas**

**TABLE OF CONTENTS (Concluded)**  
**VOLUME I**

	Page
5.4.1 Soil Contamination .....	5 - 23
<b>SECTION 6.0 CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>6 - 1</b>
6.1 SUMMARY .....	6 - 1
6.2 CONCLUSIONS .....	6 - 1
6.2.1 Soil Contamination .....	6 - 1
6.3 RECOMMENDATIONS .....	6 - 2
<b>SECTION 7.0 REFERENCES .....</b>	<b>7 - 1</b>

**VOLUME II**

<b>APPENDIX A:</b>	<b>BORING LOGS, KEY TO TERMS AND SYMBOLS, WELL REPORTS, SURVEY DATA</b>
<b>APPENDIX B:</b>	<b>FIELD GC RESULTS</b>
<b>APPENDIX C:</b>	<b>SUMMARY OF ANALYTICAL RESULTS, REPORTS OF ANALYSES, CHAIN-OF-CUSTODY FORMS, DATA VALIDATION</b>
<b>APPENDIX D:</b>	<b>HRS DATA PACKAGE</b>
<b>APPENDIX E:</b>	<b>FIELD NOTEBOOKS, FIELD BORING LOGS, DAILY FIELD REPORTS</b>

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**Site Investigation Report**  
**254th CCGP and 221st CCSQ, Garland ANGS**  
**Garland, Texas**

**LIST OF FIGURES**

<b>Figure</b>	<b>Page</b>
Cover State Location Map . . . . .	Inside Front Cover
1.1 Flow of Installation Restoration Program Tasks . . . . .	1 - 2
2.1 Installation Location Map . . . . .	2 - 2
2.2 Site No. 1 Location . . . . .	2 - 3
2.3 Post-PA Activities . . . . .	2 - 5
3.1 Physiographic Map of Texas . . . . .	3 - 2
3.2 USGS 7.5' Topographical Quadrangle Map . . . . .	3 - 3
3.3 Stratigraphic Column . . . . .	3 - 4
3.4 Surficial Geologic Map of the Area . . . . .	3 - 6
3.5 Station Surface Water Drainage Map . . . . .	3 - 8
5.1 Background Soil Boring Locations . . . . .	5 - 2
5.2 Soil Boring Locations . . . . .	5 - 9
5.3 Cross-Section A-A' . . . . .	5 - 21
5.4 Cross-Section B-B' . . . . .	5 - 22
Cover Soil Boring Locations . . . . .	Inside Back Cover

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**Site Investigation Report**  
**254th CCGP and 221st CCSQ, Garland ANGS**  
**Garland, Texas**

**LIST OF TABLES**

<b>Table</b>		<b>Page</b>
4.1	Laboratory Analysis Summary Table . . . . .	4 - 7
5.1	Background Soil Sampling and Analytical Program . . . . .	5 - 3
5.2	Analytes Detected in Background Soil Samples . . . . .	5 - 4
5.3	Maximum Concentrations vs Regulatory Standards for Background Metals . . . . .	5 - 5
5.4	PID and Field GC Results for Site No. 1 Soil Samples . . . . .	5 - 7
5.5	Soil Sampling and Analytical Program for Site No. 1 . . . . .	5 - 10
5.6	Metals Detected in Soil Samples Collected from Site No. 1 . . . . .	5 - 13
5.7	Maximum Concentrations vs Regulatory Standards for Metals (Site No. 1) . . . . .	5 - 15
5.8	Volatile Organic Compounds Detected in Soil Samples Collected from Site No. 1 . . . . .	5 - 16
5.9	Maximum Concentrations vs Regulatory Standards for VOCs (Site No. 1) . . . . .	5 - 17
5.10	Semivolatile Organic Compounds Detected in Soil Samples Collected from Site No. 1 . . . . .	5 - 19
5.11	Maximum Concentrations vs Regulatory Standards for SVOCs (Site No. 1) . . . . .	5 - 20

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**Site Investigation Report  
254th CCGP and 221st CCSQ, Garland ANGS  
Garland, Texas**

**LIST OF ACRONYMS**

AGE	Aerospace Ground Equipment
ANGS	Air National Guard Station
ANGRC/CEVR	Air National Guard Readiness Center/Installation Restoration Branch
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society of Testing and Materials
ATHA	Ambient temperature headspace analysis
BLS	Below land surface
BTEX	Benzene, Toluene, Ethylene, Xylene
CCGP	Combat Communications Group
CCSQ	Combat Communications Squadron
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cm/sec	Centimeters per second
DBP	Di-n-butylphthalate
DD	Decision Document
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EO	Executive Order
FFD	Federal Facility Docket
FS	Feasibility Study
Ft	Feet
GC	Gas chromatograph
GWP	Groundwater protection
HAS	Hazard Assessment Score
HSA	Hollow-stem auger
IRP	Installation Restoration Program
JEDI	Jones Environmental Drilling Incorporated
LTM	Long-term monitoring
mg/kg	milligrams per kilogram
ml	milliliter
MOGAS	Motor gasoline
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSL	Mean sea level
MTBE	Methyl-t-butyl-ether
NFADD	No Further Action Decision Document
OpTech	Operational Technologies Corporation
PA	Preliminary Assessment
PID	Photoionization detector
ppb	parts per billion
ppm	parts per million
PST	Petroleum Storage Tank
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
RA	Remedial Action

**Site Investigation Report  
254th CCGP and 221st CCSQ, Garland ANGS  
Garland, Texas**

**LIST OF ACRONYMS (Concluded)**

RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SAI	Soil/Air and Ingestion
SARA	Superfund Amendments and Reauthorization Act of 1986
SCS	Soil Conservation Service
SI	Site Investigation
SVOC	Semivolatile Organic Compound
TAC	Texas Administrative Code
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
TNRCC	Texas Natural Resource Conservation Committee
TSI	Tank Systems, Inc.
$\mu\text{g/L}$	micrograms per liter
USEPA	U. S. Environmental Protection Agency
UTA	Unit Training Assembly
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds

# **INSTALLATION RESTORATION PROGRAM SITE INVESTIGATION**

## **EXECUTIVE SUMMARY**

### **1.0 INTRODUCTION**

A Site Investigation (SI) was conducted at the 254th Combat Communications Group (CCGP) and the 221st Combat Communications Squadron (CCSQ), Garland Air National Guard Station (ANGS), Garland, Texas. The area of investigation, Site No. 1 (also referred to as Station Drainage Area and Fence Line) was initially identified during a Preliminary Assessment (PA) conducted by Science & Technology, Inc. in June 1990. As part of the Air National Guard Readiness Center (ANGRC) Installation Restoration Program (IRP), Operational Technologies Corporation (OpTech) conducted an SI at Garland ANGS. Field activities commenced on 18 January 1994 and were completed on 21 January 1994.

### **2.0 PREVIOUS INVESTIGATIONS**

A PA was conducted at Garland ANGS in June 1990 by Science & Technology, Inc. Information obtained during the PA indicated wastes had been disposed along the east and west fence lines of the facility. These areas were identified as Site No. 1 (Station Drainage Area and Fence Line).

In October 1991, a release from a petroleum storage tank (PST) system was identified. The system was removed by Tank Systems, Inc. (TSI) and contaminated soils were excavated. Four borings were drilled in December 1991 during a pavement repair project. Hydrocarbon odors were noted in one of the borings. Surface soil samples were collected and analyzed for volatile organic compounds (VOCs). VOCs were not detected in the soil samples.

### **3.0 SITE NO. 1 (STATION DRAINAGE AREA AND FENCE LINE)**

Site No. 1 is located in the southern half of Garland ANGS. Site No. 1 consists of an area measuring approximately 15 feet in width which extends along the fence line south of the Auto/Aerospace Ground Equipment (AGE) Building (Building 05), along the fence line west of Building 05 and the Paint Storage Building, along the fence line north of the Paint Storage Building, and along the fence line west and terminating just south of the Communications

Headquarter Building (Building 01). Also included in Site No. 1 is an area extending along a portion of the fence line east of the Supply Building (Building 04) and an area north of Building 04. Grass was the surface cover for most of the area investigated.

### **3.1 INVESTIGATION FINDINGS**

#### **3.1.1 Soil Contamination**

Past activities at the site indicated that suspected contamination consists primarily of solvents, waste oil, and fuels. Therefore, soil samples were submitted for analysis of VOCs, semivolatile organic compounds (SVOCs), priority pollutant metals, and total petroleum hydrocarbons (TPH).

Results of analyses revealed evidence of metals contamination in three soil borings. VOC contamination was detected in one boring, and SVOCs were detected in four soil borings.

Metals contamination was detected at concentrations exceeding the maximum background concentrations; however, these concentrations do not exceed the soil cleanup standards for the State of Texas. In addition, the estimated Toxicity Characteristic Leaching Procedure (TCLP) results did not exceed the Texas Groundwater Protection (GWP) Standards or the Federal toxicity characteristic standards.

VOCs were detected at concentrations that do not exceed the soil cleanup standards for the State of Texas, nor do the estimated TCLP concentrations exceed the Texas GWP Standards or the Federal toxicity standards.

SVOCs were detected at concentrations that do not exceed the Texas Soil, Air, and Ingestion (SAI) regulatory standards established for these contaminants, nor do the estimated TCLP concentrations exceed the Texas GWP or the Federal toxicity standards.

### **4.0 CONCLUSIONS**

Results of analyses indicate low concentrations of metals, VOCs and SVOCs at Garland ANGS, the source of these constituents being undetermined at this time. All contaminants encountered in analyzed soil samples are below State cleanup levels. Although the regulatory standards for these contaminants were not exceeded, the vertical and horizontal extent of these constituents

have not been fully defined, nor has the presence or absence of groundwater contamination been confirmed. Generally, analytical results indicated contaminant concentrations decreased with depth, which is consistent with the nature of contaminant releases at the site. A groundwater investigation was not conducted at the station as part of the SI. SI results indicate groundwater contamination at this site is not likely. During the SI soil borings were drilled to a depth of 12 feet BLS and groundwater was not encountered in any of the borings. According to a previous geotechnical investigation conducted in December 1991, groundwater was encountered at 15 feet BLS.

The nature of station activities precludes the occurrence of soil disturbance by on-site personnel, and the station is completely enclosed by a security fence and not generally accessible to the public. Thus potential for exposure to any receptors is low. Based on these considerations and the SI analytical results, there is no indication that further soil sampling or a groundwater investigation is warranted.

## **5.0 RECOMMENDATIONS**

Based on the data collected during the SI, additional investigative activities are not warranted, and a No Further Action Decision Document (NFADD) is recommended to close out Site No. 1.

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## **SECTION 1.0 INTRODUCTION**

This Site Investigation (SI) report presents the results of the investigation activities conducted at the 254th Combat Communications Group (CCGP) and the 221st Combat Communications Squadron (CCSQ), Garland Air National Guard Station (ANGS), Garland, Texas (see inside front cover figure).

A Preliminary Assessment (PA) of the Garland ANGS was conducted by Science & Technology, Inc. in June 1990 and published in December 1990. Information obtained through interviews, review of station records, and field observations resulted in the identification of one potentially contaminated disposal and/or spill site. The site was identified as Site No. 1 (Station Drainage Area and Fence Line) and was recommended for further investigation.

The Air National Guard Readiness Center/Installation Restoration Branch (ANGRC/CEVR) authorized Operational Technologies Corporation (OpTech) to prepare an SI Work Plan and conduct the SI at Site No. 1. The SI was conducted as outlined in the SI Work Plan (dated November 1993) submitted to the ANGRC/CEVR and the Texas Natural Resource Conservation Commission (TNRCC).

### **1.1 INSTALLATION RESTORATION PROGRAM**

The Defense Environmental Restoration Program (DERP) was established in 1984 to promote and coordinate efforts for the evaluation and cleanup of contamination at Department of Defense (DoD) installations. On 23 January 1987, Presidential Executive Order (EO) 12580 assigned specific responsibility to the Secretary of Defense for carrying out DERP within the overall framework of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Under DERP, the Installation Restoration Program (IRP) was established to identify, investigate, and clean up contamination at DoD installations. The IRP is focused on cleanup of contamination associated with past DoD activities to ensure threats to public health are eliminated and natural resources are restored for future use. The ANGRC manages the IRP and related activities at Air National Guard installations. The flow of IRP tasks is shown in Figure 1.1. The six phases of the IRP are defined and described in the following subsections.

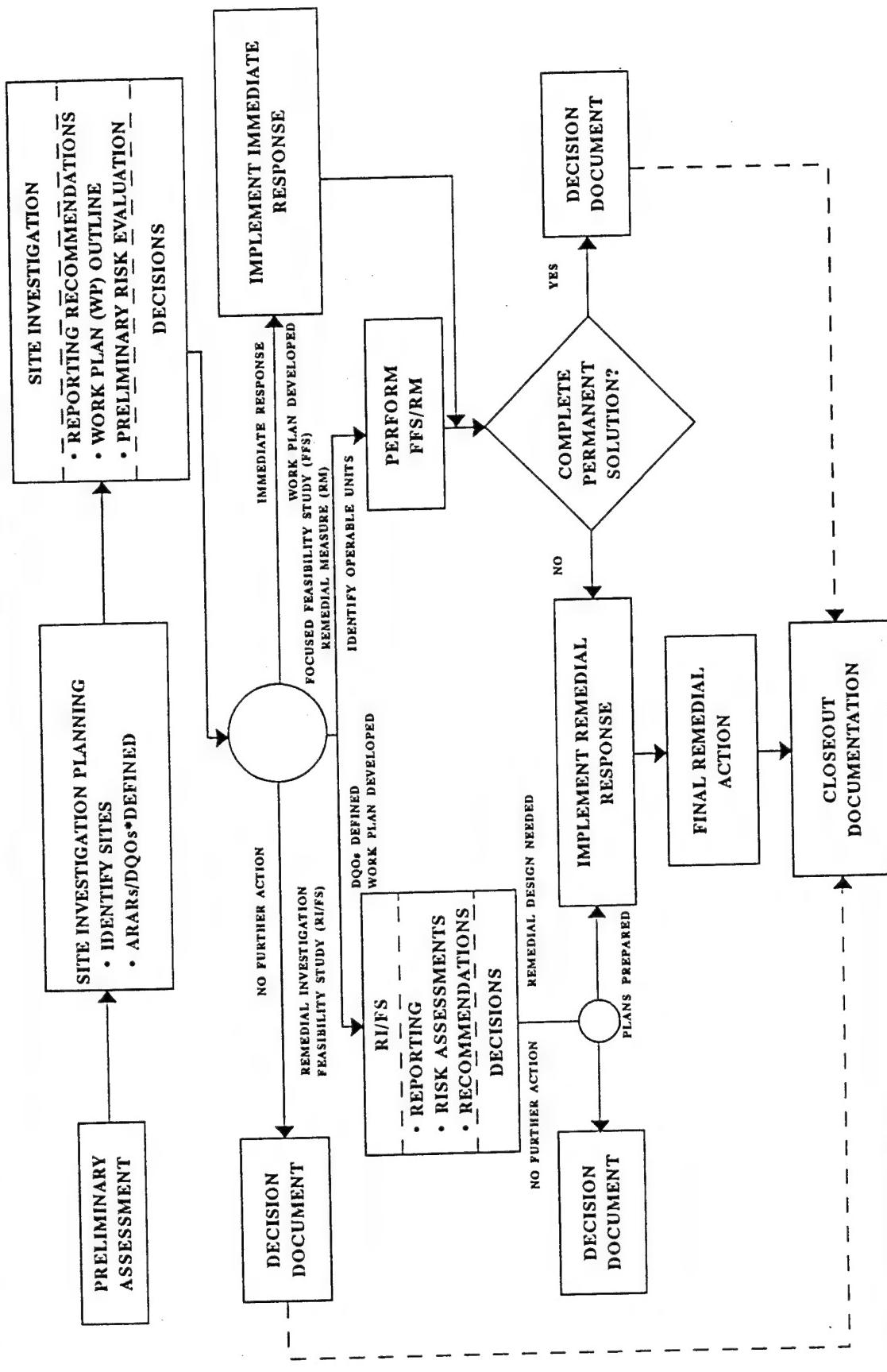


FIGURE 1.1

# STATION RESTORATION PROGRAM TASKS

## Garland Air National Guard Station Texas Air National Guard Coronado, Texas

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### **1.1.1 Preliminary Assessment (PA)**

The PA process consists of personnel interviews, a records search, and a site visit designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; installation plans; facility inventory documents; lists of hazardous materials used; subcontractor reports; correspondences; Material Safety Data Sheets; Federal/State agency scientific reports and statistics; Federal administrative documents; Federal/State records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

### **1.1.2 Site Investigation (SI)**

The SI phase consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA or during non-related IRP investigations, and to provide data needed to reach a decision point for the site. The activities undertaken during the SI generally fall into three distinct categories: screening, confirmation, and optional activities.

#### ***Screening Activities***

Screening activities are conducted prior to drilling activities to gather preliminary data on each site. Screening activities may include the use of a magnetometer survey to locate underground utilities and petroleum storage tanks (PSTs). Soil gas surveys may be performed to determine the optimum number and locations of soil borings needed to delineate soil contamination. Piezometers may be installed in order to determine the direction of groundwater flow and the locations of groundwater monitoring wells.

#### ***Confirmation Activities***

Confirmation activities include the installation of soil borings and monitoring wells; specific media sampling; and laboratory analysis. These activities are utilized to confirm the presence or absence of contamination; to determine the levels of contamination; and to determine the potential for contaminant migration. Information obtained during subsurface sampling is also used to characterize the hydrology, geology, and soil at each site.

### *Optional Activities*

Optional activities are used if additional data are needed to reach a decision for a site such as a No Further Action Decision Document is warranted, prompt removal of contaminants is necessitated, or further work is required. Optional activities may include increasing the number of sampling stations or performing additional laboratory analyses.

The general approach for the design of the SI activities is to sequence the field activities so data are acquired and used as the field investigation progresses. This is done in order to reduce the duration of site characterization, optimize data collection and data quality, and to minimize costs. Information, data, and analytical results obtained from the SI will support the selection of one of the following decision:

**No Further Action Decision Document (NFADD)** – Investigation did not indicate harmful levels of contamination that pose a significant threat to human health or the environment. Therefore, a No Further Action Decision Document will be prepared to close out the site.

**Immediate Cleanup/Remedial Activities** – Investigation indicates that the site poses an immediate threat to public health or the environment. Therefore, prompt removal of contaminants or measures to reduce contaminant levels to an acceptable limit is warranted.

**Remedial Investigation/Feasibility Study (RI/FS)** – Investigation indicates further work is required and the next phase needs to be implemented. The RI is described more fully in the following subsection.

#### **1.1.3 Remedial Investigation (RI)**

The objectives of the RI are to determine the nature and extent of contamination at a site; to determine the nature and extent of the threat to human health and the environment; and to provide a basis for determining the types of response actions to be considered (decision document, feasibility study, remedial design, remedial action).

Field activities conducted during the RI may include the installation of soil borings and/or monitoring wells, and the collection and analysis of water, soil, and/or sediment samples. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates,

and direction of contaminant migration. A baseline risk assessment may be conducted which provides an evaluation of the potential threat to human health in the absence of remedial action.

The findings from the RI are used to select one or more of the following options:

**NFADD** – RI results do not indicate harmful levels of contamination that pose a significant threat to human health or the environment. Therefore, a No Further Action Decision Document will be prepared to close out the site.

**Long-Term Monitoring (LTM)** – RI results do not indicate sufficient contamination to justify costly remedial actions. LTM may be recommended to detect the possibility of future problems.

**Feasibility Study (FS)** – RI results confirm the presence of contamination that may pose a threat to human health and/or the environment. Evaluation of remedial alternatives is needed.

#### **1.1.4 Feasibility Study (FS)**

Based on results of the RI, an FS may be performed to develop, screen, and evaluate alternatives for remediation at the subject sites. The overall objective of the FS is to provide information necessary for remedial alternative development. The FS is conducted to support selection of a remedy that:

- Protects human health and the environment;
- Attains applicable or relevant and appropriate requirements (ARARs);
- Satisfies the preference for treatment that significantly and permanently reduces toxicity, mobility, or volume of hazardous constituents as a principal element; and
- Is cost-effective.

Activities associated with the FS include development, preliminary screening, detailed analysis, and comparative analysis of remedial alternatives. Results of the FS are formally documented in an FS report and are used to select the most appropriate remedial action with concurrence by State and/or Federal regulatory agencies.

### **1.1.5 Remedial Design (RD)**

The RD involves formulation and approval of the engineering designs required to implement the selected remedial action identified in the FS.

### **1.1.6 Remedial Action (RA)**

The RA is the actual implementation of the remedial alternative to eliminate or, at a minimum, reduce the hazard to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and *in-situ* biodegradation of contaminated soils are examples of remedial alternatives that might be implemented. In some cases, after the RA has been completed, an LTM system may be installed as a precautionary measure to detect contaminant migration or to document the efficiency of remediation.

### **1.1.7 Immediate Action Alternatives**

Immediate action alternatives may be implemented during any phase of an IRP project. If a threat to public health or the environment is present, prompt control measures may be necessary. Control measures may include limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or LTM.

## **SECTION 2.0 FACILITY BACKGROUND**

Garland ANGS is located within the City of Garland in Dallas County, Texas. The location of the station is shown in Figure 2.1. Located 13 miles northeast of downtown Dallas, the station occupies approximately six acres of land situated along Glenbrook Drive. Garland ANGS is a mobile communication facility with a normal working population of approximately 34 people. The station serves as a site for Unit Training Assembly (UTA) which meets one weekend per month. During this weekend, the station population reaches approximately 225.

### **2.1 FACILITY HISTORY**

Garland ANGS was established in the late 1950s on land previously used for a park. The first building was constructed in 1959. Facilities were connected to the City of Garland water and sanitary sewer systems. The mission of the Garland ANGS is to install, operate, and maintain mobile communication facilities in support of Tactical Air Force Operations and State emergencies.

#### **2.1.1 Adjacent Land Use**

Land adjacent to the western and southern boundaries of the station is occupied by the Garland City Park. Recreational activities at the park include golf, tennis, and baseball. Residential areas are north and east of the station. A security fence completely encloses the property of the Garland ANGS.

#### **2.1.2 Waste Disposal Practices**

Mission support activities require the use and disposal of hazardous materials such as oils, hydraulic fluids, fuels, solvents, paints, and thinners. The largest user of these materials, and consequently the largest generator of waste, is the Auto/Aerospace Ground Equipment (AGE) Shop (Building 05). The location of the AGE Shop is shown on Figure 2.2. Vehicles and equipment are washed on the southwestern side of Building 04, and the water from these activities drains across the asphalt to the west.

Since 1980, wastes have been collected and stored at the facility until a contractor transports the waste off-site for proper disposal. Oil/water separators are connected to floor drains in the AGE Shop. Contents of the separators are removed and disposed by Jerry's Wasteoil.

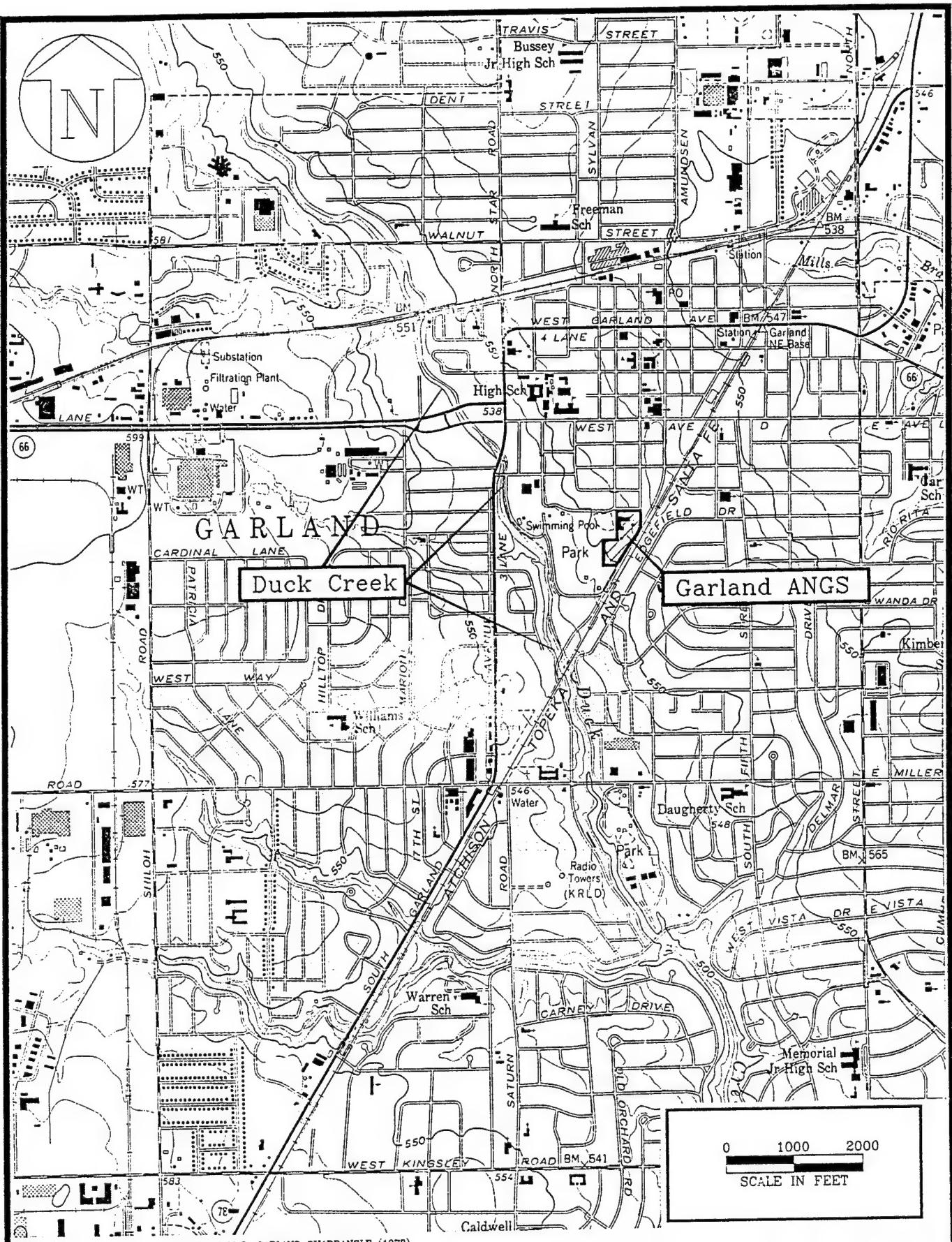


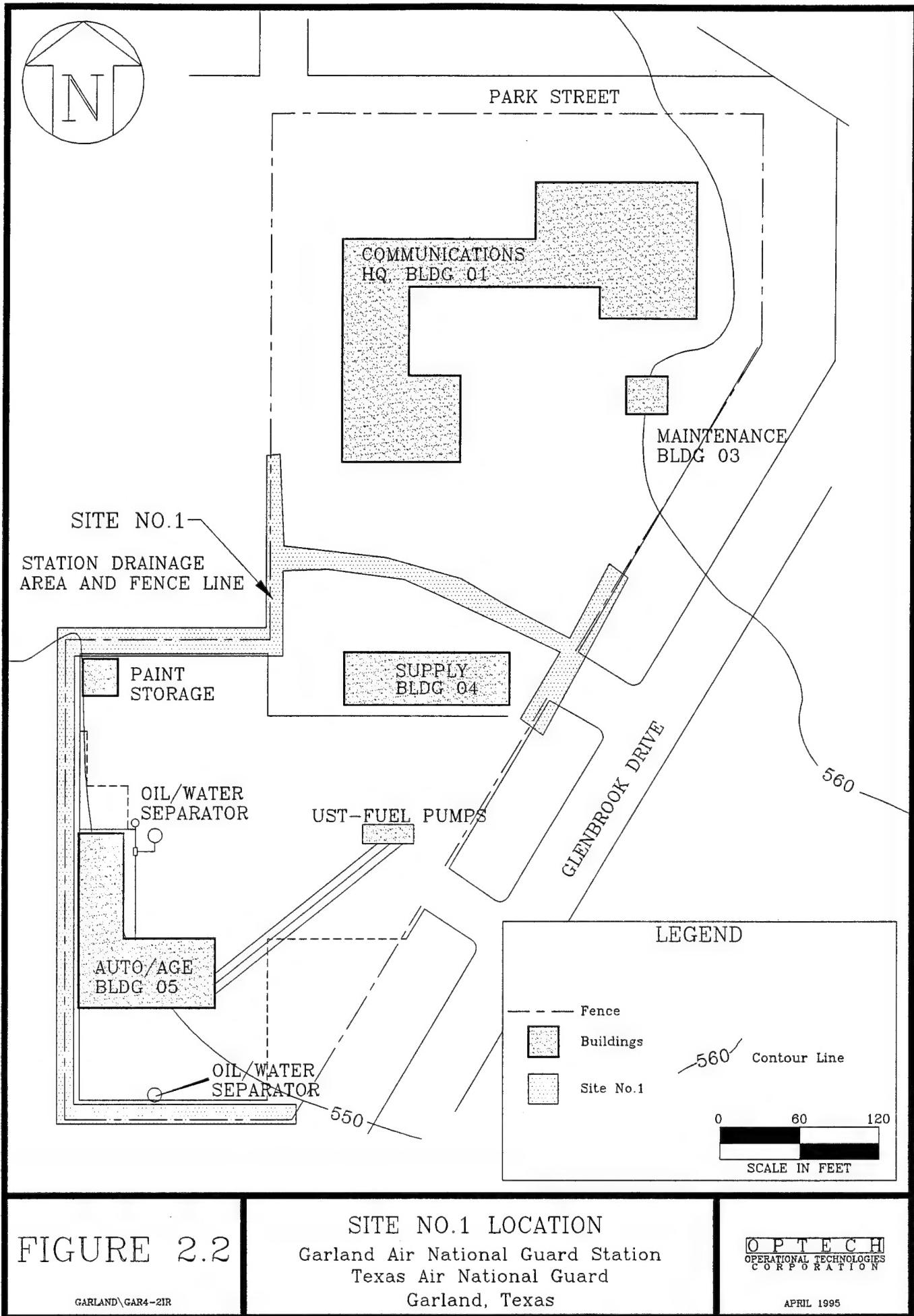
FIGURE 2.1

GARLAND\GAR4-3T0

INSTALLATION LOCATION MAP  
Garland Air National Guard Station  
Texas Air National Guard  
Garland, Texas

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### **2.1.3 Previous Investigations**

#### **2.1.3.1 Previous IRP Investigations**

A PA was conducted at the Garland ANGS in June 1990 by Science & Technology, Inc. Information obtained during the PA indicated wastes had been disposed along the east and west fence lines of the facility. These areas were identified as Site No. 1 (Station Drainage Area and Fence Line).

#### **2.1.3.2 Other Investigations**

In October of 1991, the Texas National Guard notified the Texas Water Commission (currently known as TNRCC) of a petroleum release at the Garland ANGS. The location of the source, a PST is shown in Figure 2.3. The PST system was removed by Tank Systems, Inc. (TSI) and contaminated soils were excavated. Based on the results of the abatement, no additional investigations were needed (TSI, 1992).

A subgrade evaluation was performed in December of 1991. Four borings, shown in Figure 2.3, were used to obtain data necessary for pavement reconstruction. The Pavement Repair Project included a portion of Site No. 1. Hydrocarbon odors were noted in one of the borings (B-4) drilled during the investigation. As a result, soil samples were collected and analyzed for volatile organic compounds (VOCs). However, VOCs were not detected in any of the soil samples.

## **2.2 SITE DESCRIPTION**

### **2.2.1 Site No. 1 (Station Drainage Area and Fence Line)**

The location of Site No. 1 is included on Figure 2.2. Most surface drainage at Garland ANGS is across the asphalt and into a low area along the fence line on the west side of the station. South of the AGE Building, surface water flows to the south and discharges to a storm sewer. In addition to surface runoff, the majority of spills or releases of hazardous materials drain to these areas.

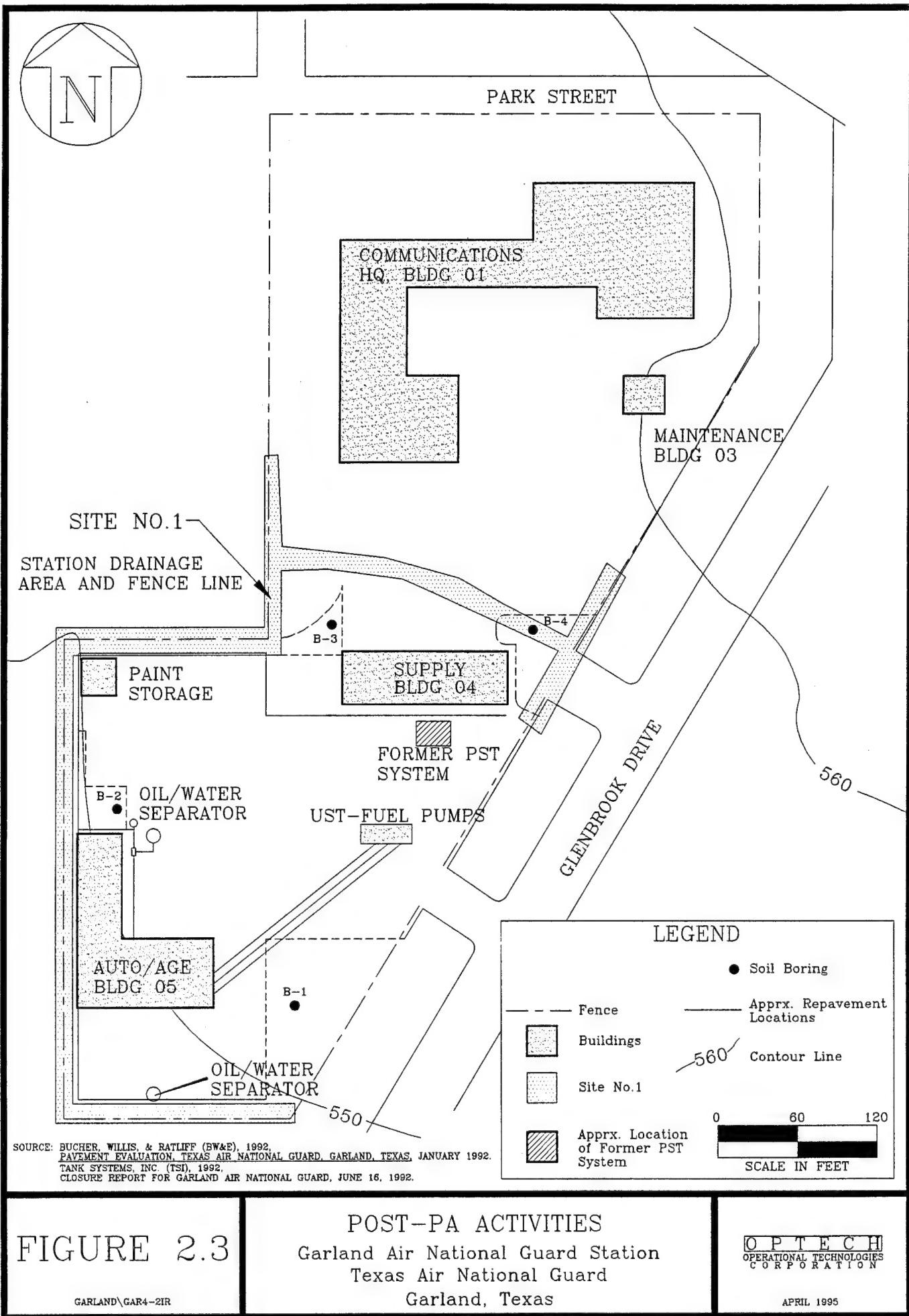


FIGURE 2.3

## **2.2.2 Site History**

From the late 1950s through the middle 1970s, unknown quantities of waste materials were disposed along the east and west fence lines at Garland ANGS. During the late 1960s, vandals released approximately 55 gallons of diesel and 55 gallons of oil onto the asphalt on the north side of Building 04. Draining to the west, the product was "washed down" by the Fire Department.

Past fuel spills and runoff from AGE equipment and generator storage areas historically drained to the southwestern corner of the property. In December 1985, this storage area was curbed and covered with concrete. The concrete was sloped toward an oil/water separator which discharges to the sanitary sewer.

## **2.2.3 Potential Release Sources**

The fence line east of the Supply Building (Building 04) was reportedly used to dispose of small (unknown) amounts of waste oils, solvents, paints, and thinners. Similar waste disposal practices were reported along the western fence line near the Paint Storage Building and the Auto/AGE building (Building 05). Small fuel spills of diesel and MOGAS (gasoline) have occurred in the area south of the Auto/AGE Building. Soil in this area was excavated.

The fence line south of the AGE Building was included in Site No. 1. Using the Federal Facility Docket (FFD) of the United States Environmental Protection Agency (USEPA), Site No. 1 was assigned a Hazard Assessment Score (HAS) of 66. This score was due to the potential migration of contaminants through surface water, soil, and/or groundwater.

## **SECTION 3.0 ENVIRONMENTAL SETTING**

### **3.1 PHYSIOGRAPHY**

Garland ANGS is located in Dallas County northeast of Dallas, Texas near the transition zone of the Central Plains to the flat-lying Black Prairies. Figure 3.1 is a Physiographic Map of Texas. The station is located near the escarpment that separates the two regions and has a surface elevation of 560 feet above mean sea level (MSL). Surface topography of the area is illustrated on Figure 3.2. Surface gradients are between 25 and 50 feet per mile toward the southwest.

### **3.2 CLIMATE**

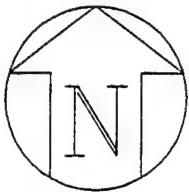
The climate is characterized by long, hot summers and short, mild winters. A significant portion of the rainfall comes from thunderstorms during the spring. The average annual precipitation, based on data from 1951 to 1980, is 35 inches. The mean evaporation rate is 56 inches per year, which results in a net precipitation loss of 21 inches per year. The weather is influenced by warm Gulf winds from the southeast and cold arctic fronts from the northwest. This combination results in a moderate average annual temperature of 66.2° F.

### **3.3 GEOLOGY**

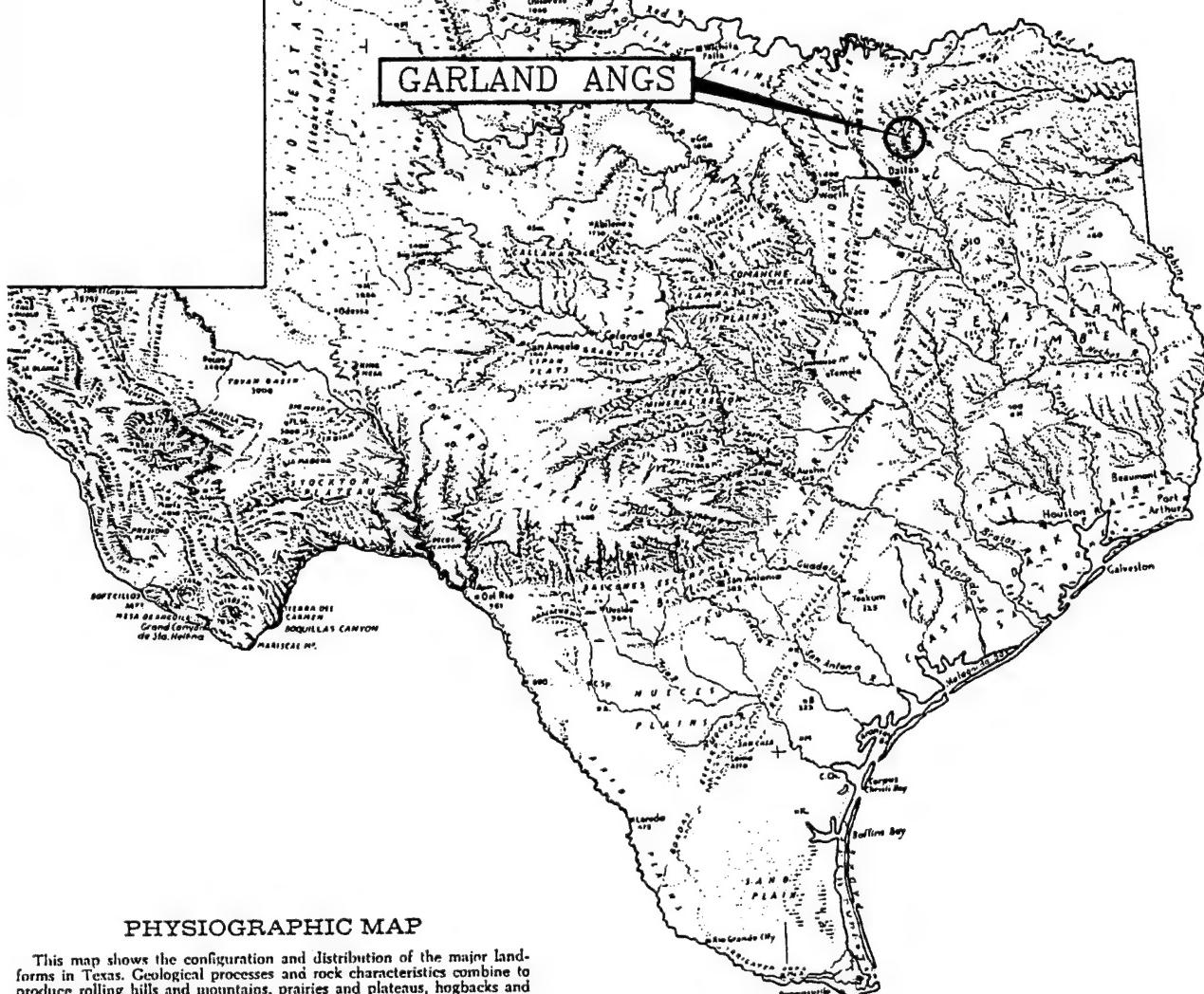
#### **3.3.1 Regional**

Garland ANGS is located in north-central Texas within the Fort Worth Basin, which underwent three significant depositional periods. A stratigraphic column is shown in Figure 3.3. During the Paleozoic Era, the Fort Worth Basin received sediments consisting of sandstone, limestone, carbonaceous shales, and other marine sediments. Deposition continued until the Late Pennsylvanian when the Llano Uplift and the Ouachita Tectonic Belt caused regional tilting to the west.

During the early Mesozoic Era, subsidence of the Gulf Coast Rift Basin caused a regression of the seas from the north-central Texas area which led to a reversal of drainage direction to the east-southeast. This caused extensive truncation of the westward dipping Pennsylvanian strata. The Pennsylvanian–Cretaceous Unconformity is characterized by the extensive erosion of Paleozoic sediments.



PHYSIOGRAPHIC MAP  
OF  
TEXAS  
MODIFIED FROM  
LANDFORMS OF THE UNITED STATES  
BY ERWIN RAISZ  
1957  
0 10 40 90 120 160  
MILES



#### PHYSIOGRAPHIC MAP

This map shows the configuration and distribution of the major landforms in Texas. Geological processes and rock characteristics combine to produce rolling hills and mountains, prairies and plateaus, hogbacks and cuestas, and basins and valleys.

Landforms of this region are related fundamentally to uplifts and depressions of the earth's crust. Water and wind are the principal erosional agents that produced the present surface irregularities. The type, composition, and texture of the rocks, and the local structure and sequence of the rock layers, are important controlling factors.

The earth's surface is changing continuously. New landforms evolve by erosion and gradual destruction of existing forms, by subsidence and uplift, and by the accumulation of freshly eroded rock materials.

The Physiographic Map supplements the other illustrations by showing the names of many surface features, by delineating areas of differential erosion, and by showing regional elevations. The other illustrations supply important information which helps to explain the geological origin of the prominent landforms. The relation of landforms in this area to landforms in adjacent states can be obtained from "Landforms of the United States" by Erwin Raisz (1957).

FIGURE 3.1

GARLAND\PHYSIO

PHYSIOGRAPHIC MAP OF TEXAS  
Garland Air National Guard Station  
Texas Air National Guard  
Garland, Texas

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Era	System	Series	Group	Stratigraphic units	Approximate thickness (feet)	Character of rocks	Water-bearing characteristics*
Cenozoic	Quaternary	Holocene		Alluvium		Sand, silt, clay and gravel.	Yields small to large amounts of fresh water to wells along the Red River.
		Pleistocene		Fluvitid terrace deposits	75	Fossiliferous clay and hard limy marl; fine sand, fossiliferous.	Upper members are not known to yield water to wells in area; lower member yields small to moderate quantities of fresh to slightly saline water near the outcrop.
			Navarro	Kemp Clay Corriana Marl Nacatoch Sand	800	Clay, marl, mudstone, and chalk.	Yields small quantities of water to shallow wells.
		Taylor		Marlbrook Marl Pecan Gap Chalk Wolfe City - Ocean Formations	1,500	Chalk, limestone and marl; fine to medium sand, fossiliferous.	Yields small to moderate quantities of fresh to moderately saline water to wells in the northeastern part of the area; very limited as an aquifer.
		Austin		Gobee Chalk Brownstown Marl Blossom Sand Bonham Formation	700	Shale with thin beds of sandstone and limestone.	Yields small quantities of water to shallow wells.
		Eagle Ford			650	Medium to coarse iron sand, sandstone, clay and some lignite.	Yields moderate to large quantities of fresh to slightly saline water to municipal, industrial and irrigation wells.
		Woodbine			700	Fossiliferous limestone, marl, and clay; some sand near top.	Yields small quantities of water to shallow wells.
		Washita			1,000	Limestone, clay, marl, shale, and shell conglomerates.	Yields small quantities of water to shallow wells.
		Fredericksburg			250	Fine sand, sandy shale, and shale.	Yields small to moderate quantities of fresh to slightly saline water to wells.
				Paluxy Formation	400	Limestone, marl, shale, and anhydrite.	Yields small quantities of water in localized areas.
				Glen Rose Formation	1,500	Fine-to-coarse sand, shale, clay, basal gravel, and conglomerate.	Yields moderate to large quantities of fresh to slightly saline water to wells.
		Comanche	Trinity	Antlers Formation	900	Sandstone, limestone, shale and conglomerate	Yields small quantities of water in the western part of the area.
				Twin Mountains Formation	1,000		
		Paleozoic		Paleozoic rocks undifferentiated			

\* Yields of wells:  
 Chemical Quality of Water:  
 small – less than 100 gallons per minute (gpm); moderate – 100 to 1,000 gpm; large – more than 1,000 gpm  
 fresh – less than 1,000 milligrams per liter (mg/l); slightly saline – 1,000 to 3,000 mg/l  
 moderately saline – 3,000 to 10,000 mg/l; very saline – 10,000 to 35,000 mg/l; brine – more than 35,000 mg/l

SOURCE: Baker, Duffin, Flores, Lynch, 1980.

FIGURE 3.3

STRATIGRAPHIC COLUMN  
 Garland Air National Guard Station  
 Texas Air National Guard  
 Garland, Texas

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Cretaceous sediments are classic transgressive/regressive sequences thickening to the southeast into the East Texas Basin. Two major transgressions of the sea are represented by the Comanche and Gulf Series sediments (Figure 3.3). The older Comanche Series is divided into the Washita Group, Fredericksburg Group, and Trinity Group. The younger Gulf Series is divided into the Navarro Group, Taylor Group, Austin Group, Eagle Ford Group, and Woodbine Group. The Trinity Group consists of the Antlers, Paluxy, Glen Rose, and Twin Mountains Formations. Toward the end of the Cretaceous, there was an uplifting in the west and subsidence of the coastal area.

During most of the Tertiary, fluvial systems dominated the region and caused erosion in the northwest and deposition to the southeast. Quaternary deposits occur along the floodplains of the major rivers in the area and their tributaries. Terrace deposits represent remnants of older floodplains of these fluvial systems and generally occur at higher elevations.

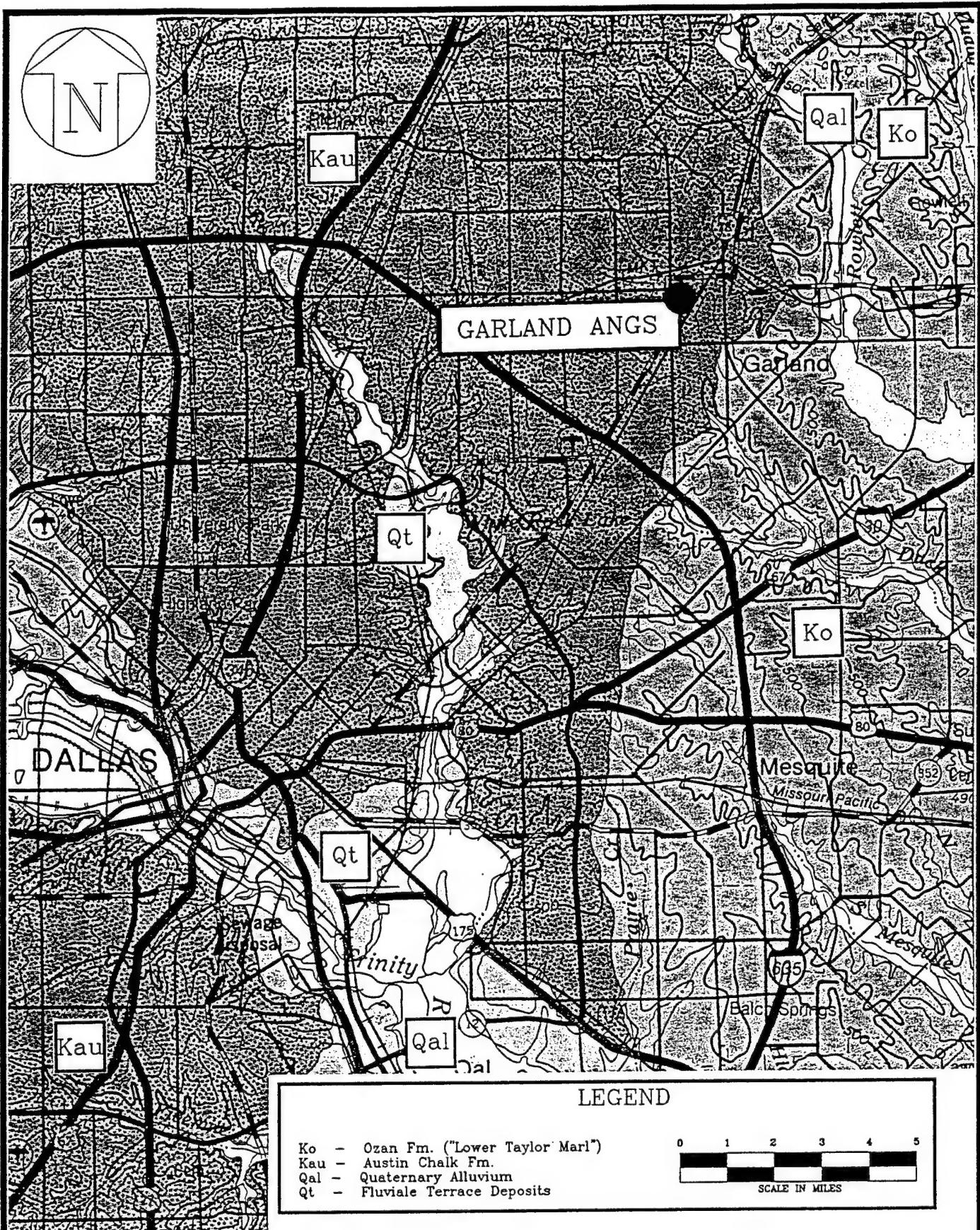
### 3.3.2 Local

The station is situated on the Austin Chalk Formation which outcrops in a 12- to 15-mile wide band that trends north-south through the area. A Surficial Geologic Map is shown in Figure 3.4. The Austin Chalk is a light gray to buff limestone and marl unit. Along Duck Creek near the station, typical sections of Austin Chalk are exposed. The Austin Chalk Formation is approximately 700 feet thick (maximum).

## 3.4 SOILS

The soil at Garland ANGS is described as the Houston Black-Urban land complex which is composed of deep, moderately well drained, nearly level and gently sloping soils (0 to 4 percent slope). Typically, the surface layer of the Houston Black soil is a moderately alkaline, dark gray, clay that is 6 inches thick. To a depth of 38 inches, the soil is a moderately alkaline, black clay. From a depth of 38 to 52 inches, the soil is a moderately alkaline, dark grayish brown clay that is mottled light olive and brown.

Immediately adjoining the Houston Black complex along the west-southwestern boundary of the station is the Lewisville-Urban soil complex. This sequence differs from the Houston Black in that the clay is silty and has a moderate permeability ( $4.45 \times 10^{-4}$  cm/sec to  $1.41 \times 10^{-3}$  cm/sec) versus the low permeability (less than  $4.24 \times 10^{-5}$  cm/sec) of the Houston Black. The information pertaining to soils was derived from the Soil Survey of Dallas County, Texas (United States Department of Agriculture, Soil Conservation Service, February 1980).



SOURCE: GEOLOGIC ATLAS OF TEXAS, DALLAS SHEET, UT AUSTIN, 1987

FIGURE 3.4

GARLAND\GAR4-5CE

**SURFICIAL GEOLOGIC MAP  
OF THE AREA**  
Garland Air National Guard Station  
Texas Air National Guard  
Garland, Texas

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### **3.5 HYDROGEOLOGY**

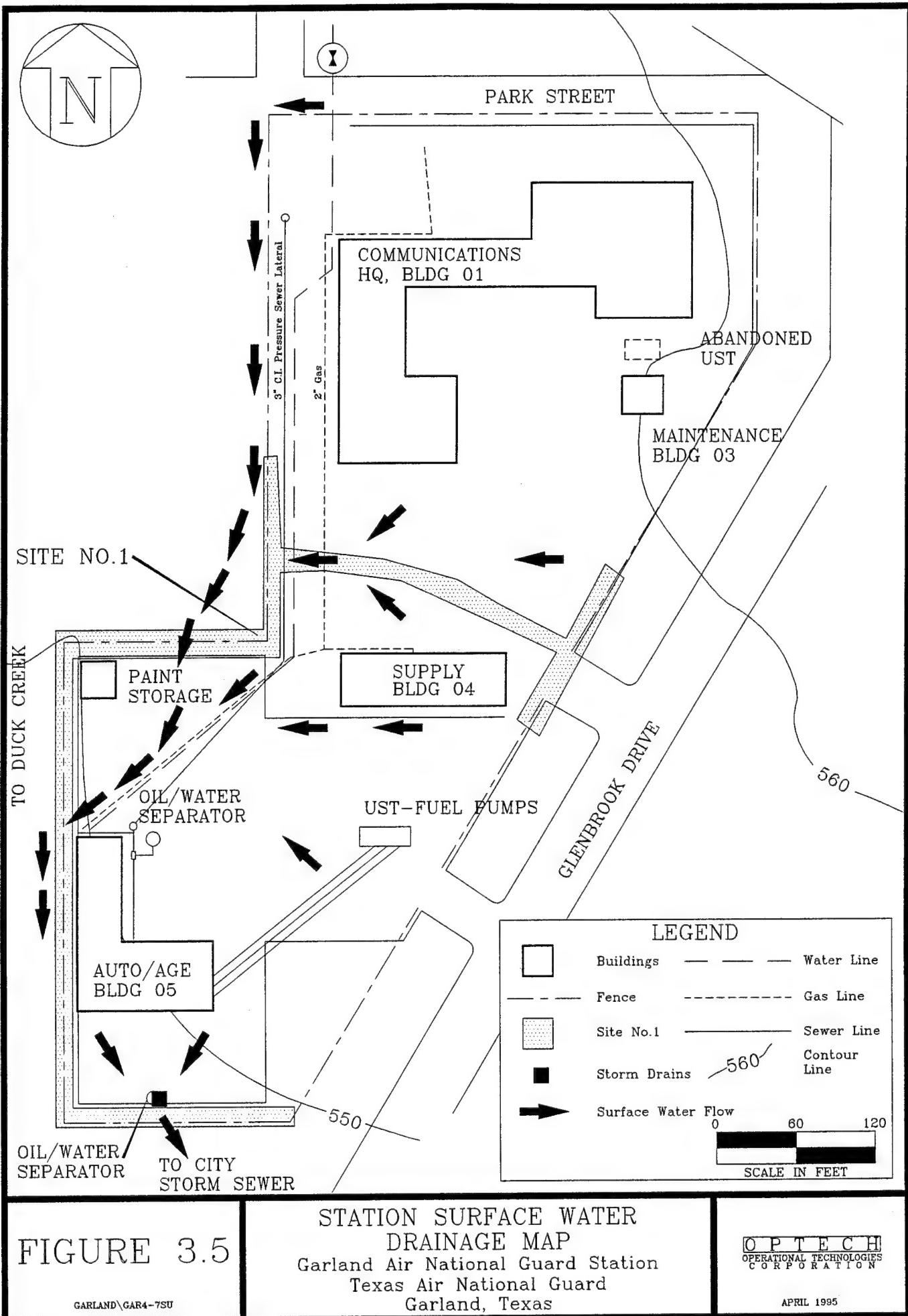
The lower Cretaceous Trinity Group Aquifer is the largest and most prolific in the region. This aquifer system is comprised of the Glen Rose, Twin Mountains, and Paluxy Formations (Figure 3.3). The Antlers nomenclature is used for the basal Trinity Sands where the Glen Rose Formation is no longer traceable in the subsurface and represents the coalescence of the Paluxy and Twin Mountains Formations. The lower sands and shales of the Twin Mountains are the hydrologic equivalent of the basal portion of the Antlers. The younger Woodbine Group overlies the Fredericksburg and Washita Groups that function as an aquitard between the Woodbine and the stratigraphically lower Paluxy Formation.

According to Baker, 1990, the Austin Chalk yields small to moderate quantities of fresh to moderately saline water to wells in the northeastern part of the area. As an aquifer, the Austin Chalk is very limited. There are no water supply wells within the immediate vicinity of the station. The City of Garland formerly had a public supply well approximately 1.5 miles from the station. However, that well was taken out of service, plugged, and abandoned several years ago. Surface water is the primary water resource for the City of Garland.

### **3.6 SURFACE WATER**

Garland ANGS is located in the Duck Creek drainage basin of the East Fork Trinity River watershed. The location of the Duck Creek drainage basin is shown in Figure 3.2.

Surface runoff, as shown in Figure 3.5, is primarily off pavement into open ditches that flow west-southwest into Duck Creek and through storm drains. The station has been classified as outside the 100-year flood plain.



## **SECTION 4.0 FIELD PROGRAM**

The purpose of the SI Field program is to establish the naturally-occurring concentrations for the contaminants of concern at the station; to confirm the presence or absence of contamination at Site No. 1; to attempt to determine the areal extent of any contaminants detected; and to provide data needed to reach a decision for the site. This section describes the methods used and the field activities performed during the SI. The field program commenced on 18 January 1994 and was completed on 21 January 1994.

### **4.1 SUMMARY**

No screening activities, other than soil screening, were performed during the field investigation at Garland ANGS. Soil samples were field screened using a photoionization detector (PID) and field gas chromatograph (GC) to provide immediate information as to the environment of the borehole, and to aid in the selection of soil samples to be submitted for laboratory analysis.

Confirmation activities consisted of drilling soil borings to confirm the presence or absence of contamination at Site No. 1. In addition, soil samples collected from upgradient locations established background concentrations applicable to the site.

### **4.2 DEVIATIONS FROM WORK PLAN**

There were deviations from the work plan approved by the ANGRC. However, in no way did any of the changed procedures or protocols prevent accomplishing the overall objectives of the SI. The deviations from and the corresponding sections of the Work Plan were as follows:

- Distilled water, not American Society of Testing and Materials (ASTM) Type II reagent water as outlined in Section 6.3, was used to decontaminate field equipment. Three field blanks of distilled water were submitted during field work and analyzed for all target analytes.
- VOC analyses were performed using SW846 method 8260 rather than SW8240 as stated in Section 6.4.4.3. Method SW8260 has a lower detection limit than SW8240.

- The detection limit for cadmium in water was incorrectly referenced on Table 8.4. The correct detection limit for method SW7131 is 0.05 parts per million (ppm).
- Methyl-t-butyl-ether (MTBE) was not used as a calibrant for the field GC as outlined in Section 6.4.4.2. Since MTBE was not identified as a contaminant of concern during the PA, the addition of this compound to the calibration standard was deemed unnecessary. The field GC was calibrated for benzene, toluene, ethylbenzene, and xylenes (BTEX), as outlined in Section 6.4.4.2.
- Arsenic was analyzed using both method SW7060, as described in Section 6.4.4.3, and method SW6010. Method SW6010 was performed to verify results obtained using method SW7060.

#### **4.3 FIELD SCREENING ACTIVITIES**

Field screening activities, such as a soil gas survey or installing piezometers, were not performed during the SI. Soil screening was performed during the field investigation at Garland ANGS to provide immediate information as to the environment of the borehole, and to aid in the selection of soil samples to be submitted for laboratory analysis.

During sampling of soil borings, the air around the sampler was monitored with a HNu DL-101 Data Logging PID immediately upon opening the sampler (to maximize the detection of volatiles). Soil was then screened using a Photovac 10S50 Portable GC. The soil samples collected were placed in plastic bags, and the HNu DL-101 PID used to conduct ambient temperature headspace analysis (ATHA) for photoionization compounds. All PID readings are indicated on the boring logs included in Appendix A. The Photovac 10S50 Portable GC, calibrated to screen for BTEX, was used to detect the presence of these compounds in the headspace for the soil samples collected.

Once the soil sample for laboratory analysis had been prepared, ambient temperature headspace analysis was conducted for the remaining soil. The remaining soil was placed in a plastic bag for 15 minutes and allowed to reach ambient air temperature. After 15 minutes, a headspace reading was collected using the field GC. Headspace analysis was used as a tool to determine which sample intervals best characterized the environment of the borehole or demonstrated the highest headspace reading. Data obtained from the field GC and PID was used to supplement

laboratory data. Field GC data is summarized in Section 5.3.2, Screening Results, and is included in Appendix B.

#### **4.3.1 Field Sample Preparation**

The 24-inch California-style sampler, used to collect samples, contained four 6-inch long brass sleeves used to collect soil samples. The sleeve selected for analytical analysis were the ones with the most representative, cohesive, and undisturbed core of soil as determined by observation by the on-site geologist. In most instances, the sleeves at the bottom of the sampler best represented sampling needs and were selected for analysis. The sleeve at the top of the sampler was usually not selected because it contained the drill cuttings from the bottom of the borehole when the sampler was driven. Two sleeves were submitted to the laboratory to insure sufficient volumes of soil were recovered at each sampling interval to meet the analytical testing requirements. In the event that an insufficient volume was obtained, an additional sample was collected immediately beneath the unsuccessful sample interval.

All soil samples and associated QA/QC samples submitted for laboratory analysis collected with the California-style split-spoon sampler were contained in brass sleeves. Immediately upon removal from the sampler, the sleeve ends were covered with a Teflon™ barrier, aluminum foil, and fitted with a plastic cap. The plastic caps were then secured with duct tape. The sleeves were properly labeled, placed in plastic bags, stored in coolers, and chilled to 4° C to preserve samples until delivery to the laboratory.

#### **4.3.2 Equipment Calibration**

##### **4.3.2.1 Field GC**

The field GC was operated and standardized using a 1 ppm BTEX headspace sample for a 1-point calibration conducted each day prior to beginning sampling activities. This headspace standard was prepared daily by dilution of a 2,000 ppm BTEX stock solution. The calibration was checked periodically during usage throughout the day, after approximately 10 sample analyses. Air blank samples were also used to assess any problems with sample or standard cross-contamination.

#### **4.3.2.2 Photoionization Detector**

Calibration of the PID was performed at the start of each day using 100 ppm isobutylene, a standard calibration gas. Additional calibrations were made during the day if the unit experienced abnormal perturbations, readings became erratic, or if the unit was powered off. Calibration procedures were performed as outlined in the manufacturer's instructions.

### **4.4 CONFIRMATION ACTIVITIES**

Confirmation activities were performed in order to characterize the site. Jones Environmental Drilling, Inc. (JEDI) was retained as the drilling contractor. The drilling contractor mobilized personnel and equipment that met or exceeded ANGRC and State of Texas requirements.

Chemron, Inc. of San Antonio, Texas was retained to perform analytical laboratory analyses. Provisions were made for proper sample containers, labels, chain-of-custody forms, sample stabilization and preservation, and insulated sample containers.

Geogram Corporation of Dallas, Texas was retained as the surveying contractor. All soil boring locations were surveyed. The land surface elevations of each borehole are shown on the borehole logs included in Appendix A.

#### **4.4.1 Soil Borings**

Soil borings were drilled to obtain soil samples for laboratory analysis to define soil contamination if present, to define site geology, and subsurface soil characteristics. A total of 13 soil borings were drilled. Eleven soil borings were drilled at the site and two borings were drilled upgradient of the site in order to determine background conditions. All work was performed in a manner consistent with State of Texas laws and regulations.

Borings were drilled using hollow-stem auger (HSA) methods. The HSA drilling method employs a hollow helical steel drill tool that is rotated to advance the boring and lift formation materials (cuttings) to the surface. The flights for the HSA are welded onto steel pipe and a cutter head is attached to the "lead" (bottom) auger to cut the hole. During drilling, a center bit is inserted into the hollow area of the cutter head that prevents cuttings from re-entering the hollow portion of the auger. Generally, the center bit is flush with or extends no more than 1/2 foot below the cutter head. The center bit connects through the auger flights by small diameter drill rods and is attached to the top-head drive unit of the drill rig. The top-head drive is

powered by a truck-mounted engine that mechanically rotates the entire flight of augers. The hollow opening allows the insertion of sampling tools (i.e., split-spoon sampler) with the augers in place to prevent caving of the borehole.

Auger flights, drill rig(s), and tools were thoroughly steam-cleaned in the designated decontamination area south of Building 04 before initial use and after the completion of each borehole.

Soil samples were collected for subsurface characterization and field screening. A 24-inch carbon steel California-style sampler equipped with four 6-inch brass sleeves was used for collecting soil samples for laboratory analysis. Actual sample depths submitted for laboratory analysis are discussed in Section 5.0, Investigation Findings, and shown on the borehole logs included in Appendix A. The California-style sampler was decontaminated and new brass sleeves inserted before each sampling event.

Borehole abandonment activities conformed to State of Texas requirements. Borings were backfilled with grout after sampling to prevent downward migration of contaminants through the open borehole. Borings were grouted from the bottom of the borehole to the surface.

Soil boring coordinates and ground elevation were determined by a professional surveyor.

#### **4.4.2 Specific Media Sampling**

This subsection summarizes the analytical program followed for soil samples collected during the site investigation to determine the nature, magnitude, and extent of contamination detected at the site. Also included in this subsection is a brief discussion of quality control procedures followed during the field sampling activities.

##### **4.4.2.1 Soil**

Past activities at the site indicate suspected contamination consists primarily of solvents, waste oil, and fuels. Therefore, the primary analytical program of the SI focused on the detection of VOCs, semivolatile organic compounds (SVOCs), priority pollutant metals, and total petroleum hydrocarbons (TPH). To fulfill the requirements of the SI, soil samples were analyzed for VOCs using method SW8260; SVOCs by method SW8270; priority pollutant metals by method SW6010 with the exception of arsenic (SW7060), cadmium (SW7131), chromium (SW7196),

lead (SW7420), mercury (SW7470), selenium (SW7740), and thallium (SW7841); and TPH by USEPA method 418.1.

Table 4.1 summarizes the analytical program designed to detect suspected contaminants at the site.

#### **4.4.2.2 Quality Control of Field Sampling**

Field blank, trip blank, and equipment blank samples were submitted to the laboratory for assessing the quality of data resulting from the field sampling program. Field, trip, and equipment blank samples were analyzed for procedural contamination and ambient conditions at the site that may have caused sample contamination.

The level of the quality control effort included two field blank and two equipment blank samples. One VOC analysis trip blank, consisting of distilled, de-ionized, ultra pure water, was included along with each shipment of samples. One matrix spike/matrix spike duplicate (MS/MSD) was collected for every 20 or fewer soil samples. Matrix samples provide information about the effect of the sample matrix on the analytical methodology.

#### **4.4.2.3 Sample Preservation**

Soil samples submitted for laboratory analysis were contained in brass sleeves. Immediately upon removal from the sampler, the sleeve ends were covered with Teflon™ barrier, aluminum foil and fitted with a plastic cap. The plastic caps were then secured with duct tape. Prepared samples were placed in individual, sealed zip-lock bags and immediately stored on ice.

Equipment blanks and field blanks were collected as aqueous samples. Unpreserved, SVOC samples were stored in 1-liter amber glass bottles sealed with teflon-lined lids. VOC samples were preserved with hydrochloric acid, stored in 40-ml VOA vials, and sealed with teflon-lined lids. TPH samples were preserved with sulfuric acid and stored in 1-liter amber glass bottles. Samples submitted for total recoverable metal were preserved with nitric acid and stored in 1-liter high density polyethylene bottles. All bottles were sealed with Teflon™-lined lids.

### **4.5 INVESTIGATION DERIVED WASTE**

During the SI, a certain amount of waste material (personal protective equipment, drill cuttings, and decontamination water) was produced as a result of investigative activities. Waste material

**Table 4.1**  
**Laboratory Analysis Summary Table**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Site No.	Matrix	Field Parameters	Lab Parameters	USEPA Methods	Investigating Samples	Number of Field QA/QC Samples				
						Trip Blanks	Equipment Blanks	Field Blanks	MS/MSD	Matrix Totals
1	Soil (Subsurface)	Soil Gas Screening using PID/Field GC Soil Classification	VOC SVOC TPH METALS	SW5030/8260 SW8270 418.1 SW6010 <sup>a</sup>	22	2*	2	2	2	26
BG	Soil (Subsurface)	Soil Gas Screening using PID/Field GC Soil Classification	VOC SVOC TPH METALS	SW8260 SW8270 418.1 SW6010 <sup>a</sup>	6	1*				6

\*Trip and Equipment – Blanks are not counted in Matrix Total.

USEPA – Environmental Protection Agency.

MS/MSD – Matrix Spike/Matrix Spike Duplicate.

BG – Background.

PID – Photoionization Detector.

GC – Gas Chromatograph.

QA/QC – Quality Assurance/Quality Control.

SVOC – Semivolatile Organic Compounds.

TPH – Total Petroleum Hydrocarbons.

VOC – Volatile Organic Compounds.

<sup>a</sup>With the exception of arsenic (SW7060), cadmium (SW7131), chromium (SW7196), lead (SW7420), mercury (SW7470), selenium (SW7740), and thallium (SW7841).

was separated by source and contained in 55-gallon drums. Drill cuttings from each boring were contained separately. All drums were properly labelled to indicate source and contents, date of collection, name and phone number of contractor.

Thirteen 55-gallon drums of soil and three 55-gallon drums of decontamination water are stored along the fence line north of Building 07. OpTech personnel contacted the Region 12 Office of TNRCC regarding disposal of investigation-derived waste. The Municipal Solid Waste Division was unable to classify the waste generated during the SI. As a result, Region 12 directed OpTech personnel to contact the Special Waste Division of the TNRCC Central Office in Austin. The disposition of drums containing waste material produced during the SI will be made pending classification from the Special Waste Division of TNRCC.

## **SECTION 5.0 INVESTIGATION FINDINGS**

### **5.1 BASE-WIDE GEOLOGIC AND HYDROGEOLOGIC INVESTIGATION RESULTS**

The scope of work did not allow sufficient data to be collected during the SI conducted at Site No. 1 to determine base-wide geologic and hydrogeologic characteristics.

### **5.2 BACKGROUND SAMPLING RESULTS**

#### **5.2.1 Background Sampling Locations**

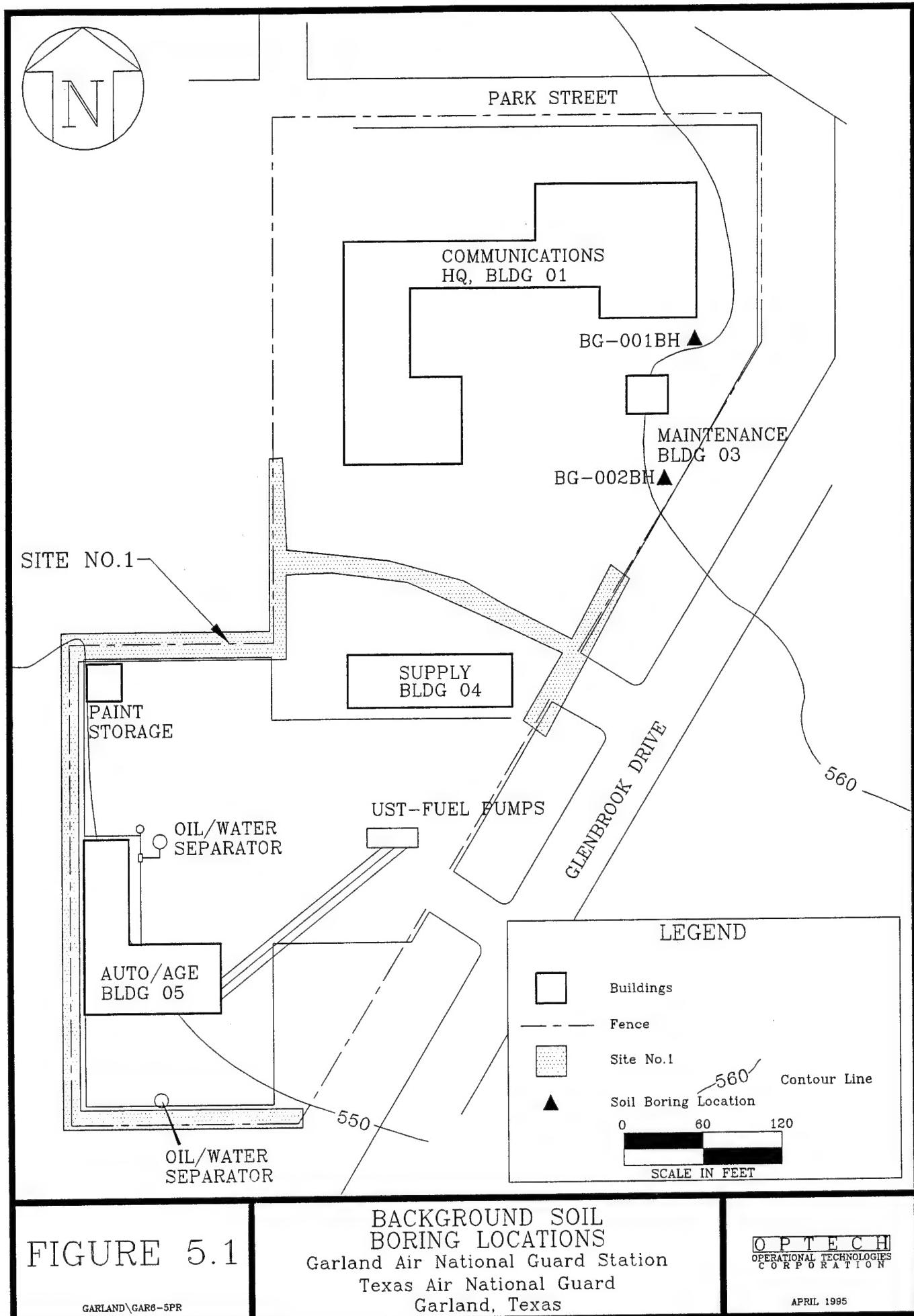
Background data at Garland ANGS consisted of two soil borings, BG-001BH and BG-002BH. These borings were located outside known areas of contamination. Soil borings BG-001BH and BG-002BH are located north of the site, approximately 15 feet south of Building 01 and 50 feet south of Building 03, respectively (see Figure 5.1). Field screening of soil samples collected during drilling indicated no evidence of contamination at either background boring location. Field GC screening results are included in Appendix B.

#### **5.2.2 Background Sampling**

Soil samples were collected for laboratory analysis from background locations to determine naturally occurring concentration levels, and contaminant or chemical concentrations already existing in the area due to general environmental conditions. Analytical results obtained during this sampling represent background conditions against which contaminant concentrations detected at Site No. 1 will be compared and the significance of detected contamination determined.

##### **5.2.2.1 Soil Sampling Results**

Soil borings BG-001BH and BG-002BH were drilled and soil samples collected on 19 January 1994. Both soil borings were drilled and sampled to a depth of 8.0 feet below land surface (BLS). In boring BG-001BH, brown sand was encountered from surface to a depth of 1.5 feet BLS, brownish-gray clay from 1.5 to 5.0 feet BLS, and white marl from 5.0 feet BLS to total depth. In boring BG-002BH, brownish-gray clay was encountered from surface to a depth of 5.0 feet BLS, white clay from 5.0 to 7.0 feet BLS, and white marl from 7.0 feet BLS to total depth. No saturated conditions were encountered in either boring.



Six investigative soil samples, three from each boring, were collected for laboratory analysis. Sampling depths and the analytical program are indicated on Table 5.1.

**Table 5.1**  
**Background Soil Sampling and Analytical Program**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Borehole Number	Sample Depth (Feet BLS)	Additional Samples	Soil Analyses and Methods			
			VOCs (SW8260)	SVOCs (SW8270)	TPH (418.1)	Metals (6010)*
BG-001BH	1.0-2.0		X	X	X	X
BG-001BH	4.0-5.0		X	X	X	X
BG-001BH	7.0-8.0		X	X	X	X
BG-002BH	1.0-2.0		X	X	X	X
BG-002BH	4.0-5.0		X	X	X	X
BG-002BH	7.0-8.0		X	X	X	X
		01-002TB	X			

\*With the exception of Arsenic (SW7060), Mercury (SW7470), Selenium (SW7740), Thallium (SW7841), Cadmium (SW7131), Chromium (SW7196), and Lead (SW7420).

BG – Background.

BH – Borehole.

SVOCs – Semivolatile Organic Compounds.

TPH – Total Petroleum Hydrocarbons.

X – Analyses performed.

TB – Trip Blank.

BLS – Below Land Surface.

VOCs – Volatile Organic Compounds.

Data validation did not uncover any problems which would affect the investigation. QA/QC sample analytical results are included in Appendix C.

Table 5.2 summarizes the analytes detected in soil samples collected from background locations. A complete listing of the results for all analytical parameters for each sample is given in Appendix C.

VOCs, SVOCs, and TPH were not detected in any of the background soil samples.

Metals were detected in soil samples as shown in Table 5.2. Arsenic was detected using Method SW7060; however, arsenic was not detected when samples were reanalyzed using Method SW6010. The concentrations detected using Method SW7060 were the result of aluminum interference (See Appendix C for details).

**Table 5.2**  
**Analytes Detected in Background Soil Samples**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring Number	Sample Depth (Ft BLS)	Be (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg)	Zn (mg/kg)
BG-001BH	1.0-2.0	0.1U	0.05	15.0	11.0	8.9	10.0	33.0
BG-001BH	4.0-5.0	1.3	0.05	21.0	11.0	11.0	16.0	40.0
BG-001BH	7.0-8.0	0.5	0.15	7.7	3.4	3.3	5.5	17.0
BG-002BH	1.0-2.0	0.1U	0.1	21.0	11.0	14.0	15.0	40.0
BG-002BH	4.0-5.0	1.3	0.1	18.0	7.4	10.0	12.0	33.0
BG-002BH	7.0-8.0	0.8	0.05	15.0	9.0	3.7	10.0	31.0
Number of Samples		4	6	6	6	6	6	6
Mean		0.9	0.08	16.3	8.8	8.5	11.4	32.3
Standard Deviation		0.4	0.04	5.0	3.02	4.2	3.8	8.4

mg/kg – milligrams per kilogram.

Be – Beryllium.

Cd – Cadmium.

Cr – Chromium.

Ft – Feet.

BH – Borehole.

Cu – Copper.

Pb – Lead.

Ni – Nickel.

Zn – Zinc.

BLS – below land surface.

U – Not detected. Number indicates method detection limit.

BG – Background.

Beryllium was detected at concentrations ranging from 0.5 to 1.3 mg/kg, cadmium from 0.05 to 0.15 mg/kg, chromium from 7.7 to 21.0 mg/kg, copper from 3.4 to 11.0 mg/kg, lead from 3.3 to 14.0 mg/kg, nickel from 5.5 to 16.0 mg/kg, and zinc from 17.0 to 40.0 mg/kg. The highest concentrations of metals were detected in soil sampled from boring BG-001BH from a depth of 4.0 to 5.0 feet BLS and from boring BG-002BH from a depth of 1.0 to 2.0 feet BLS.

Analytical results obtained during this sampling were used to determine naturally occurring concentrations in the background borings. Statistical calculations were performed in order to determine the mean and standard deviation for each contaminant detected in the soil samples. If contaminants were not detected, the sample was not used in the statistical calculation. The mean and standard deviation for each metal detected are included in Table 5.2. Statistical information will be used to determine if concentrations detected in soil samples collected from Site No. 1 exceed background concentrations.

A Toxicity Characteristic Leaching Procedure (TCLP) result can be estimated by dividing the maximum total concentration detected, for each contaminant, by the dilution factor (20). Using

this method, the estimated TCLP result was calculated for the maximum concentration detected for each analyte. The results are provided in Table 5.3. These estimates were used to determine if a potential for exceeding regulatory standards existed and to select potential disposal methods for investigation derived waste. As stated, TCLP data are only estimates. Actual TCLP analyses should be performed if a potential for exceeding regulatory standards exists.

**Table 5.3**  
**Maximum Concentrations vs Regulatory Standards for Background Metals**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Metals	Max Conc (mg/kg)	SAI Res (mg/kg)	SAI Ind (mg/kg)	TCLP** (mg/kg)	GWP Res (mg/kg)	GWP Ind (mg/kg)	Toxicity (mg/kg)
Beryllium	1.3	149.0	133.0	0.065	0.4	0.4	-
Cadmium	0.15	137.0	1,020.0	0.0075	0.5	0.5	1.0
Chromium	21.0	391.0	5,110.0	1.05	10.0	10.0	5.0
Copper	11.0	-	-	0.55	-	-	-
Lead	11.0	500.0	1,000.0	0.55	1.5	1.5	5.0
Nickel	16.0	1,560.0	20,400.0	0.8	10.0	10.0	-
Zinc	40.0	-	-	2.0	-	-	-

Note: TCLP laboratory analyses were not performed. This is only an estimate and should not be used in place of laboratory analyses.

mg/kg – milligrams per kilogram.

SAI – Soil/Air and Ingestion Standard.

Res – Residential.

Max Conc – Maximum Concentration.

GWP – Groundwater Protection.

TCLP – Toxicity Characteristic Leaching Procedure.

Ind – Industrial.

" – " – Regulatory Standard has not been established.

Under the Texas Solid Waste Disposal Act, the TNRCC manages hazardous waste. Risk reduction standards are defined in the Texas Administrative Code (TAC), Title 30, Chapter 335, Subchapter S. The TNRCC has initiated a Risk Reduction program for any person who has allowed waste to discharge into or adjacent to any waters in the State of Texas. If the discharge poses a threat to human health or the environment, the responsible party must perform remediation which meets one or more performance standard.

Performance standards are the media-specific maximum concentrations assumed to be protective of groundwater, human ingestion, and human inhalation. For soils, the maximum concentrations are the Soil Air and Ingestion (SAI) Standard and the Groundwater Protection (GWP) Standard.

As shown on Table 5.3, the metal concentrations detected in the background borings do not exceed the regulatory standards. In addition, the estimated TCLP concentrations do not exceed

the maximum contaminant concentration of the GWP Standard toxicity characteristic for hazardous waste.

### **5.3 SITE NO. 1 FINDINGS**

Site No. 1 is located in the southern half of Garland ANGS. Site No. 1 consists of an area measuring approximately 15 feet in width which extends along the fence line south of the Auto/AGE Building (Building 05), along the fence line west of Building 05 and the Paint Storage Building, along the fence line north of the Paint Storage Building, and along the fence line west and terminating just south of the Communications Headquarter Building (Building 01). Also included in Site No. 1 is an area extending along a portion of the fence line east of the Supply Building (Building 04) and an area north of Building 04. Grass was the surface cover for most of the area investigated.

#### **5.3.1 Geologic and Hydrologic Results**

The surface at Garland ANGS is predominately concrete or asphalt. However, grass was the surface cover for most of the area investigated, with the exception of boring locations 01-001BH, 01-010BH, and 01-011BH. To a depth of 5.0 feet BLS, a soft to firm clay was encountered. The clay was dark brownish-gray with widely scattered caliche. In borings 01-009BH, 01-010BH, and 01-011BH, located south of Building 05, fill material replaced the clay. The fill material had been placed by base personnel to control surface runoff.

Underlying the fill material/clay stratum, the top of the Austin Chalk Formation was encountered. Upper stratigraphy of the Austin Chalk consisted of a mottled yellow and white, firm to stiff clay with caliche. With depth, the consistency of the clay increased, resulting in a marl unit. The white marl unit was hard and, in some cases, prevented auger penetration. Borings were completed in the Austin Chalk at depths ranging from 8.0 to 12.0 feet BLS. Complete lithologic logs and completed State of Texas Well Reports are provided in Appendix A.

Moderate permeability (less than  $4.24 \times 10^4$  cm/sec) of the surface soil results in a medium rate of surface runoff (SCS, 1980). As an aquifer, the Austin Chalk is limited, yielding only small to moderate quantities of potable water (Baker, 1990). Groundwater was not encountered to the maximum depth (12.0 feet BLS) for borings completed during this investigation. However, the top of the water table is approximately 15.0 feet BLS (Science & Technology, 1990).

### 5.3.2 Screening Results

The headspace of 24 soil samples was screened for photoionization compounds and total BTEX using a PID and field GC, respectively. Copies of the Field GC Data Summary Sheets and GC printouts for these samples are provided in Appendix B. PID readings for each sample are indicated on the boring logs included in Appendix A. Results for the field analyses are provided on Table 5.4 for samples in which photoionization compounds and/or total BTEX were detected.

**Table 5.4  
PID and Field GC Results for Site No. 1 Soil Samples  
254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring	Sample Interval (Feet BLS)	PID Readings (ppm)	Field GC Results Corrected Concentrations (ppb)				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX
01-008BH	1.0-2.0	0	2.6	3.3	46.2	U	52.1
01-008BH	7.0-8.0	20	4.1	U	15.9	U	20.0
01-009BH	8.0-10.0	3	U	U	U	U	-

U – Analyte was not detected.

BLS – Below Land Surface.

PID – Photoionization Detector.

ppm – parts per million.

ppb – parts per billion.

BH – Borehole.

Photoionization compounds were detected at concentrations of 20 ppm and 3 ppm in soil samples collected from boring 01-008BH from a depth of 7.0 to 8.0 feet BLS and from boring 01-009BH from a depth of 8.0 to 10.0 feet BLS, respectively. Using the GC, total BTEX was detected at concentrations of 52.1 parts per billion (ppb) and 20.0 ppb in the headspace of samples collected from boring 01-008BH from depths of 1.0 to 2.0 feet BLS and 7.0 to 8.0 feet BLS, respectively. Photoionization compounds and total BTEX were not detected in the headspace of the remaining soil samples.

### 5.3.3 Soils

Soil samples collected from eleven soil borings were used to characterize Site No. 1. Twenty-two investigative soil samples were submitted for laboratory analysis to provide an assessment of the presence and type of soil contamination present.

### **5.3.3.1 Soil Boring Locations**

Eleven soil borings (01-001BH through 01-011BH) were drilled at Site No. 1 in order to confirm the presence or absence of soil contamination (see Figure 5.2). All soil borings were drilled in their originally proposed locations as specified in the SI work plan.

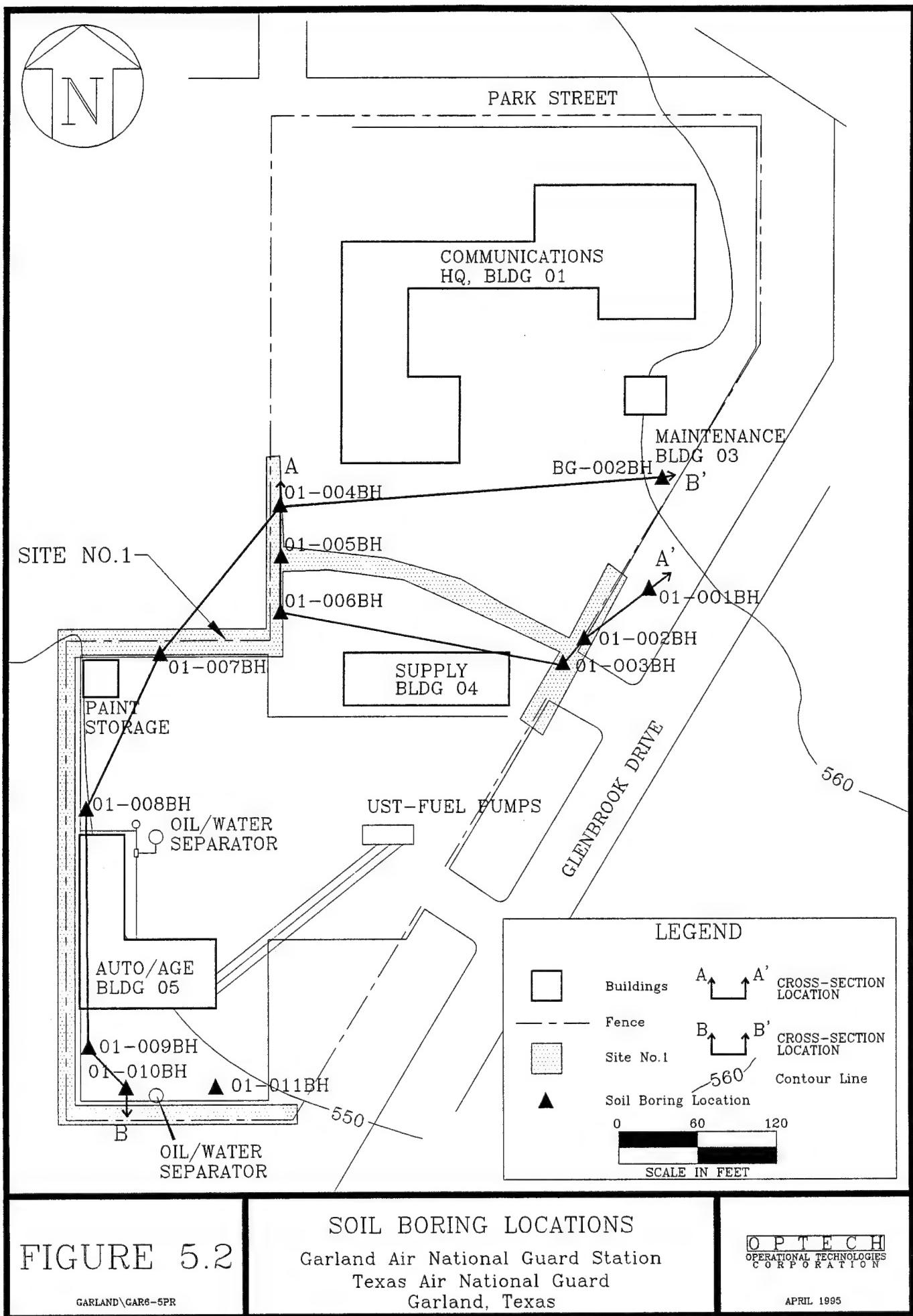
Soil borings 01-001BH, 01-002BH, and 01-003BH were located along the fence line east of Building 04 to confirm or deny the presence of contamination associated with reported disposal of small (unknown) amounts of waste oils, solvents, paints, and thinners. Soil borings 01-004BH through 01-008BH were located along the west fence line of the station to determine if contamination is present from disposal of waste materials along the west fence line and from surface runoff draining to this area. Soil borings 01-009BH, 01-010BH, and 01-011BH were located south of Building 05 and along the south fence line to determine if contamination is present from past fuel spills and runoff from AGE equipment and generator storage areas.

### **5.3.3.2 Nature and Extent of Soil Contamination**

Eleven soil borings were drilled at the site from which 22 investigative and six QA/QC samples (trip, equipment, and field blanks) were submitted for laboratory analysis. The borings were drilled and soil samples collected from 18 January to 20 January 1994.

Soil contamination at the site was suspected to consist primarily of solvents, waste oil, and fuels. SI activities confirmed evidence of metals contamination in soil borings 01-005BH, 01-008BH, and 01-009BH. Cadmium, copper, lead, silver, thallium, and zinc were detected in soil borings that exceeded the maximum background concentrations established at the station through background soil sampling. VOC contamination was detected in soil sampled from boring 01-008BH, SVOC contamination was detected in soil sampled from boring 01-001BH, 01-003BH, 01-004BH, and 01-006BH, and TPH contamination was not detected at any soil boring locations. Sections 5.3.3.2.1 through 5.3.3.2.3 discusses in detail soil contamination found at the site.

Sampling intervals submitted for laboratory analysis and the analytical program are presented in Table 5.5. Data validation did not uncover any problems which would affect the investigation. QA/QC sample analytical results are included in Appendix C.



**Table 5.5**  
**Soil Sampling and Analytical Program for Site No. 1**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Borehole Number	Sample Depth (ft BLS)	Additional Samples	Analyses and Method			
			VOCs (SW8260)	SVOCS (SW8270)	TPH (4181)	Metals (SW6010)
01-001BH	4.5-5.5		X	X	X	X
01-001BH	7.0-8.0		X	X	X	X
01-002BH	1.0-2.0		X	X	X	X
01-002BH	7.0-8.0		X	X	X	X
01-003BH	1.0-3.0		X	X	X	X
01-003BH	6.0-8.0		X	X	X	X
01-004BH	1.0-2.0		X	X	X	X
01-004BH	7.0-8.0		X	X	X	X
01-005BH	1.0-2.0		X	X	X	X
01-005BH	6.0-8.0	MS/MSD	X	X	X	X
01-006BH	2.0-3.0		X	X	X	X
01-006BH	7.0-8.0		X	X	X	X
01-007BH	2.0-3.0		X	X	X	X
01-007BH	7.0-8.0		X	X	X	X
01-008BH	2.0-3.0		X	X	X	X
01-008BH	7.0-8.0		X	X	X	X
01-009BH	4.0-5.0		X	X	X	X
01-009BH	9.0-10.0		X	X	X	X

**Table 5.5 (Concluded)**  
**Soil Sampling and Analytical Program for Site No. 1**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Borehole Number	Sample Depth (ft BLS)	Additional Samples	Analyses and Method		
			VOCs (SW8260)	SVOCS (SW8270)	TPH (418.1)
01-010BH	3.0-4.0		X	X	X
01-010BH	9.0-10.0		X	X	X
01-011BH	2.0-3.0		X	X	X
01-011BH	10.0-12.0	MS/MSD	X	X	X
	TB-1	X			
	TB-3	X			
	EB-1	X	X	X	X
	EB-2	X	X	X	X
	FB-1	X	X	X	X
	FB-2	X	X	X	X

\*With the exception of Arsenic (SW7060), Mercury (SW7470), Selenium (SW7740), Thallium (SW7841), Cadmium (SW7131), Chromium (SW7196), and Lead (SW7420). BH – Borehole.  
TB – Trip Blank.

EB – Equipment Blank.  
FB – Field Blank.

VOCs – Volatile Organic Compounds.  
SVOCS – Semivolatile Organic Compounds.  
TPH – Total Petroleum Hydrocarbons.

X – Analyses performed.

MS/MSD – Matrix Spike/Matrix Spike Duplicate.

ft – Feet.

BLS – Below Land Surface.

### **5.3.3.2.1 Metals Contamination**

Metals detected in soil samples collected at Site No. 1 and associated QA/QC samples are summarized on Table 5.6. Analytes detected in the associated QA/QC samples were chromium, copper, lead, nickel, selenium, thallium, and zinc. Distilled water, as outlined in Section 4.2, was used to prepare the QA/QC samples (trip, equipment, and field blanks). In most cases, the concentrations detected for these analytes in the equipment blank were equal to or less than the concentrations detected for the same analyte in the field blanks. Therefore, these concentrations represent elements inherent in the distilled water used to prepare the QA/QC samples, and are not indicative of improper decontamination procedures.

Chromium, copper, lead, nickel, and zinc were detected in all soil borings at concentrations ranging from 5.7 to 21.0 mg/kg, 4.0 to 23.0 mg/kg, 0.15 to 26.0 mg/kg, 6.9 to 16.0 mg/kg, and 19.0 to 51.0 mg/kg, respectively. Beryllium was detected in all soil borings, with the exception of boring 01-001BH and 01-002BH, at concentrations ranging from 0.1 to 1.3 mg/kg. Cadmium was detected in all soil borings, with the exception of boring 01-007BH, at concentrations ranging from 0.05 to 1.3 mg/kg. Silver was detected at a concentration of 0.9 mg/kg in soil sampled from boring 01-005BH from a depth of 1.0 to 2.0 feet BLS, and at 0.55 mg/kg in soil sampled from boring 01-009BH from a depth of 4.0 to 5.0 feet BLS. Thallium was detected in borings 01-001BH, 01-002BH, 01-005BH, and 01-009BH at concentrations ranging from 0.05 to 0.2 mg/kg.

The maximum concentrations detected in the soil samples for each metal are listed in Table 5.7. The maximum background concentrations were exceeded for cadmium, copper, lead, silver, thallium, and zinc. Concentrations within the standard deviation of the maximum background concentration (Table 5.2) are not considered evidence of contamination. Therefore, evidence of metals contamination is present only in borings 01-005BH (cadmium, copper, lead, silver, thallium, and zinc), 01-008BH (copper) and 01-009BH (silver, and thallium). However, these concentrations do not exceed the soil cleanup standards for the State of Texas. The estimated TCLP results (calculated as described in Section 5.2.2.1) did not exceed the Texas GWP Standards or the Federal toxicity characteristic standards.

### **5.3.3.2.2 VOCs Contamination**

VOCs detected in soil samples collected at Site No. 1 and associated QA/QC samples are summarized in Table 5.8. Several VOCs were detected in soil samples collected from Site No. 1. Acetone was detected at a concentration of 0.85 mg/kg in soil sampled from boring

**Table 5.6**  
**Metals Detected in Soil Samples Collected from Site No. 1**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring Number	Sample Depth (Ft BLS)	Date Collected	Be (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Tl (mg/kg)	Zn (mg/kg)
01-001BH	4.5-5.5	1/18/94	0.1U	0.1	8.8	5.1	1.9	8.6	0.15U	0.1	25.0
01-001BH	7.0-8.0	1/18/94	0.1U	0.05	10.0	7.2	4.5	12.0	0.15U	0.1	37.0
01-002BH	1.0-2.0	1/18/94	0.1U	0.1	20.0	13.0	12.0	16.0	0.15U	0.2	41.0
01-002BH	7.0-8.0	1/18/94	0.1U	0.05	6.2	5.1	1.6	9.0	0.15U	0.1	23.0
01-003BH	1.0-3.0	1/19/94	1.1	0.05U	12.0	7.7	9.9	14.0	0.15U	0.05U	23.0
01-003BH	6.0-8.0	1/19/94	0.8	0.05	8.4	6.1	7.5	13.0	0.15U	0.05U	19.0
01-004BH	1.0-2.0	1/19/94	0.1U	0.05	18.0	10.0	14.0	16.0	0.15U	0.05U	39.0
01-004BH	7.0-8.0	1/19/94	0.9	0.05	13.0	6.7	5.5	14.0	0.15U	0.05U	40.0
01-005BH	1.0-2.0	1/20/94	0.8	1.3	15.0	20.0	26.0	16.0	0.9	0.1	51.0
01-005BH	6.0-8.0 (MS/MSD)	1/20/94	0.1	0.05	5.7	4.0	4.1	6.9	0.15U	0.05U	22.0
01-006BH	2.0-3.0	1/19/94	1.2	0.05	15.0	11.0	13.0	15.0	0.15U	0.05U	30.0
01-006BH	7.0-8.0	1/19/94	0.1U	0.05U	15.0	7.0	4.1	12.0	0.15U	0.05U	39.0
01-007BH	2.0-3.0	1/19/94	1.0	0.05U	12.0	8.3	8.4	11.0	0.15U	0.05U	26.0
01-007BH	7.0-8.0	1/19/94	0.1U	0.05U	6.2	5.1	2.6	9.6	0.15U	0.05U	23.0
01-008BH	2.0-3.0	1/19/94	1.2	0.05	20.0	12.0	9.4	16.0	0.15U	0.05U	40.0
01-008BH	7.0-8.0	1/19/94	0.95	0.05U	14.0	23.0	7.9	11.0	0.15U	0.05U	36.0
01-009BH	4.0-5.0	1/20/94	1.3	0.15	21.0	9.2	0.15	13.0	0.55	0.15	44.0
01-009BH	9.0-10.0	1/20/94	0.8	0.1	12.0	7.1	4.4	7.7	0.15U	0.05	25.0

**Table 5.6 (Concluded)**  
**Metals Detected in Soil Samples Collected from Site No. 1**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring Number	Sample Depth (ft BLS)	Date Collected	Be (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Tl (mg/kg)	Zn (mg/kg)
01-010BH	3.0-4.0	1/20/94	0.8	0.05	10.0	4.4	2.2	7.3	0.15U	0.05U	22.0
01-010BH	9.0-10.0	1/20/94	1.1	0.05	17.0	9.7	6.2	9.4	0.15U	0.05U	29.0
01-011BH	2.0-3.0	1/20/94	1.0	0.1	14.0	9.0	9.5	9.8	0.15U	0.05U	31.0
01-011BH	10.0-12.0 (MS/MSD)	1/20/94	1.1	0.1	16.0	9.6	9.5	11.0	0.15U	0.05U	30.0

**Metals Detected in Associated QA/QC Samples**

Boring Number	Date Collected	Cr ( $\mu\text{g/L}$ )	Cu ( $\mu\text{g/L}$ )	Pb ( $\mu\text{g/L}$ )	Ni ( $\mu\text{g/L}$ )	Se ( $\mu\text{g/L}$ )	Th ( $\mu\text{g/L}$ )	Tl ( $\mu\text{g/L}$ )	Zn ( $\mu\text{g/L}$ )
EB-1	1/19/94	0.008	0.005U	0.014	0.008U	0.002	0.001U	0.001U	0.12
EB-2	1/20/94	0.002	0.007	0.019	0.008U	0.006	0.001U	0.001U	0.022
FB-1	1/19/94	0.010	0.013	0.002U	0.052	0.008	0.003	0.003	0.032
FB-2	1/20/94	0.018	0.005U	0.019	0.016	0.002U	0.001U	0.001U	0.018

Ft – Feet.

Be – Beryllium.

Cr – Chromium.

Cu – Copper.

FB – Field Blank.

BLS – Below Land Surface.

EB – Equipment Blank.

Cd – Cadmium.

Ni – Nickel.

Pb – Lead.

Se – Selenium.

Th – Thallium.

Tl – Tlalium.

Zn – Zinc.

$\mu\text{g/L}$  – micrograms per Liter.

mg/kg –

milligrams per

kilogram.

U – Not detected. Number

indicates method detection

limit.

Table 5.7

**Maximum Concentrations vs Regulatory Standards for Metals (Site No. 1)**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring	Max Concentration Concentration Detected (mg/kg)	Background (mg/kg)	SAI Res (mg/kg)	SAI Ind (mg/kg)	TCLP** (mg/kg)	GWP Res (mg/kg)	GWP Ind (mg/kg)	Toxicity (mg/kg)
Be	01-009BH	1.3	1.3	149.0	133.0	0.065	0.4	0.4
Cd	01-005BH	1.3	0.15	137.0	1,020.0	0.065	0.5	0.5
Cr	01-009BH	21.0	21.0	391.0	5,110.0	1.05	10.0	10.0
Cu	01-002BH 01-005BH 01-008BH 01-008BH	13.0 20.0 12.0 23.0	11.0	—	—	1.15	—	—
Pb	01-002BH 01-004BH 01-005BH 01-006BH	12.0 14.0 26.0 13.0	11.0	500.0	1,000.0	1.30	1.5	5.0
Ni	01-002BH 01-004BH 01-005BH 01-008BH	16.0 16.0 16.0 16.0	16.0	1,560.0	20,400.0	0.8	10.0	10.0
Ag	01-005BH 01-009BH	0.9 0.55	ND	1,370.0	10,200.0	—	18.3	51.1
Th	01-001BH 01-002BH 01-005BH 01-009BH	0.1 0.2 0.1 0.15	ND	—	—	—	—	—
Zi	01-002BH 01-005BH 01-009BH	41.0 51.0 44.0	40.0	—	—	2.550	—	—

\*\*Note: TCLP analyses were not performed. This is only an estimate and should not be used in place of laboratory analyses.  
 Be – Beryllium. Cd – Cadmium. Zn – Zinc.  
 Cr – Chromium. Cu – Copper. SAI – Soil/Air and Ingestion.  
 Pb – Lead. Ni – Nickel. Res – Residential.  
 Ag – Silver. Th – Thallium. Max Concentration – Maximum Concentration.

ND – Not Detected. Protection. GWP – Groundwater  
 " – " – Regulatory Standard has not been established.  
 mg/kg – milligrams per kilogram.

**Table 5.8**  
**Volatile Organic Compounds Detected in Soil Samples Collected from Site No. 1**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring Number	Date Collected	Sample Depth (Ft BLS)	Acetone (mg/kg)	Chloroform (mg/kg)	Ethybenzene (mg/kg)	M,P,Xylene (mg/kg)	O-Xylene (mg/kg)	Vinyl Chloride (mg/kg)
01-001BH	1/18/94	7.0-8.0	0.85	0.009U	0.015U	0.012U	0.012U	0.006U
01-008BH	1/19/94	2.0-3.0	0.36U	0.01U	0.047	0.033	0.018	0.006U
01-011BH	1/20/94	2.0-3.0	0.34U	0.009U	0.016U	0.012U	0.012U	0.006

**Volatile Organic Compounds Detected in Associated QA/AC Samples**

Boring Number	Date Collected	Sample Depth (Ft BLS)	Acetone ( $\mu\text{g/L}$ )	Chloroform ( $\mu\text{g/L}$ )	Ethybenzene ( $\mu\text{g/L}$ )	M,P,Xylene ( $\mu\text{g/L}$ )	O-Xylene ( $\mu\text{g/L}$ )	Vinyl Chloride ( $\mu\text{g/L}$ )
TB-1	1/18/94	N/A	0.01U	0.001U	0.001U	0.001U	0.001U	0.001U
TB-3	1/20/94	N/A	0.01U	0.02	0.001U	0.001U	0.001U	0.001U
EB-1	1/19/94	N/A	0.01U	0.001U	0.001U	0.001U	0.001U	0.001U
EB-2	1/20/94	N/A	0.01U	0.018	0.001U	0.001U	0.001U	0.001U
FB-1	1/19/94	N/A	0.01U	0.001U	0.001U	0.001U	0.001U	0.001U
FB-2	1/20/94	N/A	0.01U	0.005	0.001U	0.001U	0.001U	0.001U

U – Not detected. Number indicates method detection limit.

BH – Borehole.

TB – Trip Blank.

FB – Field Blank.

mg/kg – milligrams per kilogram.

$\mu\text{g/L}$  – micrograms per Liter.

EB – Equipment Blank.

N/A – Not Applicable.

Ft – Feet.

BLS – Below Land Surface.

01-001BH from a depth of 7.0 to 8.0 feet BLS. Acetone is commonly used during laboratory procedures and may represent laboratory-induced contamination. Vinyl chloride was detected at a concentration of 0.006 mg/kg in soil sampled from boring 01-011BH from a depth of 2.0 to 3.0 feet BLS. The source of vinyl chloride, encountered at the method detection limit of 0.006 mg/kg, is undetermined.

Ethylbenzene, m- and p-xylenes, and o-xylene were detected in soil sampled from boring 01-008BH from a depth of 2.0 to 3.0 feet BLS at concentrations of 0.047 mg/kg, 0.033 mg/kg, and 0.018 mg/kg, respectively. Based on the absence of these constituents in the background borings, the soil near the location of boring 01-008BH appears to be impacted by ethylbenzene and total xylenes. Major uses of these constituents include paint thinners, insecticide sprays, and gasoline blends. The vertical extent of these constituents appears to be limited to the shallow soils (2.0 to 3.0 feet) of boring 01-008BH. During migration, approximately 98% of the total mass of ethylbenzene and total xylene adsorb to unsaturated soils (Arthur D. Little, Inc., 1985).

In Table 5.9, the concentrations detected are compared to the soil cleanup standards for the State of Texas. These concentrations do not exceed cleanup standards. In addition, the estimated TCLP concentrations do not exceed the Texas GWP Standards or the Federal toxicity standards. The migration potential of these constituents is limited based on the high sorption rate, low permeability of the unsaturated soils, and the absence of groundwater. This conclusion is supported by the absence of these constituents in the soil sample collected from the 7.0 to 8.0 foot interval of boring 01-008BH.

**Table 5.9**  
**Maximum Concentrations vs Regulatory Standards for VOCs (Site No. 1)**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Chemical	Boring	Max Conc (mg/kg)	SAI Res (mg/kg)	SAI Ind (mg/kg)	TCLP** (mg/kg)	GWP Res (mg/kg)	GWP Ind (mg/kg)
Ethylbenzene	01-008BH	0.047	11,400	17,000	0.00235	70	70
Xylene (total)	01-008BH	0.051	6,000	5,800	0.00255	1,000	1,000

\*\*Note: TCLP analyses were not performed. This is only an estimate and should not be used to replace actual laboratory analyses.

Max Conc – Maximum Concentration.

Ind – Industrial.

GWP – Groundwater Protection.

SAI – Soil/Air Ingestion.

mg/kg – milligrams per kilogram.

Res – Residential.

TCLP – Toxicity Characteristic Leaching Procedure.

### **5.3.3.2.3 SVOCs Contamination**

SVOCs detected in soil samples collected from Site No. 1 are summarized in Table 5.10. SVOCs were not detected in the associated QA/QC samples. Benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene were detected in soil sampled from boring 01-004BH from a depth of 1.0 to 2.0 feet BLS at concentrations of 0.34 mg/kg, 0.54 mg/kg, 0.44 mg/kg, and 0.48 mg/kg, respectively. The absence of the constituents in the QA/QC samples and background soil samples indicates the soils at this location have been impacted.

Benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene occur in coal tar and are insoluble in water (Merck and Company, 1989). The surface near boring 01-004BH is covered with asphalt. A potential source for these constituents is surface runoff across the asphalt surface.

Di-n-butylphthalate (DBP) was detected in soil samples collected from borings 01-001BH, 01-003BH, 01-004BH, and 01-006BH at concentrations ranging from 0.45 to 0.64 mg/kg. Primarily used as a plasticizer for epoxy resins and polyvinyl chloride (PVC), DBP is also used as an adjusting agent for lead chromate pigments, as an insect repellent, and as an additive to concrete. The areas in which DBP was detected coincide with the areas resurfaced (as discussed in Section 2.0). A potential source of the DBP may be the concrete used to repave the surface in these areas. The horizontal and vertical extent of DBP at the site has not been fully defined. DBP has a very low volatility and is strongly adsorbed to soil (Arthur D. Little, Inc., 1985). Potential migration via runoff is enhanced by the strong adsorption rate of this compound.

Table 5.11 lists the maximum concentrations for the SVOCs detected at the site. The maximum concentrations do not exceed the Texas SAI regulatory standards established for these contaminants. In addition, the estimated TCLP data does not exceed the Texas GWP or the Federal toxicity standards.

A cross-section of borings 01-004BH, 01-005BH, 01-006BH, 01-003BH, 01-002BH, and 01-001BH is shown in Figure 5.3. Shown in Figure 5.4 is a cross-section of borings 01-010BH, 01-009BH, 01-008BH, 01-007BH, 01-004BH, and BG-002BH. These cross-sections are indexed in Figure 5.2.

**Table 5.10**  
**Semivolatile Organic Compounds Detected in Soil Samples Collected from Site No. 1**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Boring Number	Date Collected	Sample Depth (ft BLS)	Benz(a) Anthracene (mg/kg)	Di-n-butylphthalate (mg/kg)	Fluoranthene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
01-001BH	1/18/94	4.5-5.5	0.33U	0.46	0.33U	0.33U	0.4U
01-003BH	1/19/94	6.0-8.0	0.33U	0.64	0.33U	0.33U	0.4U
01-004BH	1/19/94	1.0-2.0	0.34	0.53	0.54	0.44	0.48
01-004BH	1/19/94	7.0-8.0	0.33U	0.45	0.33U	0.33U	0.4U
01-006BH	1/19/94	2.0-3.0	0.33U	0.60	0.33U	0.33U	0.4U
01-006BH	1/19/94	7.0-8.0	0.33U	0.55	0.33U	0.33U	0.4U

**Semivolatile Organic Compounds Detected in Associated QA/QC Samples**

Boring Number	Date Collected	Sample Depths (ft BLS)	Benz(a) Anthracene ( $\mu\text{g/L}$ )	Di-n-butylphthalate ( $\mu\text{g/L}$ )	Fluoranthene ( $\mu\text{g/L}$ )	Phenanthrene ( $\mu\text{g/L}$ )	Pyrene ( $\mu\text{g/L}$ )
EB-1	1/19/94	N/A	10U	10U	10U	10U	10U
EB-2	1/20/94	N/A	10U	10U	10U	10U	10U
FB-1	1/19/94	N/A	10U	10U	10U	10U	10U
FB-2	1/20/94	N/A	10U	10U	10U	10U	10U

EB – Equipment Blank.

FB – Field Blank.

QA/QC – Quality Assurance/Quality Control.

N/A – Not Applicable.

mg/kg – milligrams per kilogram.

$\mu\text{g/L}$  – micrograms per Liter.

U – Not detected. Number indicates method detection limit.

BH – Borehole.

Ft – Feet.

BLS – Below Land Surface.

**Table 5.11**  
**Maximum Concentrations vs Regulatory Standards for SVOCs (Site No. 1)**  
**254th CCGP and 221st CCSQ, Garland ANGS, Garland, Texas**

Chemical	Boring	Max Conc (mg/kg)	SAI Res (mg/kg)	SAI Ind (mg/kg)	TCLP** (mg/kg)	GWP Res (mg/kg)	GWP Ind (mg/kg)
Benzo(a)anthracene	01-004BH	0.34	59,100	151,000	0.017	1,100	3,070
Di-n-butylphthalate	01-003BH	0.64	27,400	204,000	0.032	365	10,200
Fluoranthene	01-004BH	0.54	11,000	81,800	0.027	146	409
Phenanthrene	01-004BH	0.44	—	—	0.022	—	—
Pyrene	01-004BH	0.48	10.8	96.8	0.024	0.144	0.484

\*\*Note: TCLP laboratory analyses were not performed. This is only an estimate and should not replace actual TCLP analyses in a laboratory.

mg/kg – milligrams per kilogram.

Max Conc – Maximum Concentration.

SAI – Soil/Air and Ingestion.

GWP – Groundwater Protection.

TCLP – Toxicity Characteristic Leaching Procedure.

Res – Residential.

Ind – Industrial.

“–” – Regulatory Standard has not been established.

## 5.4 CONCLUSIONS

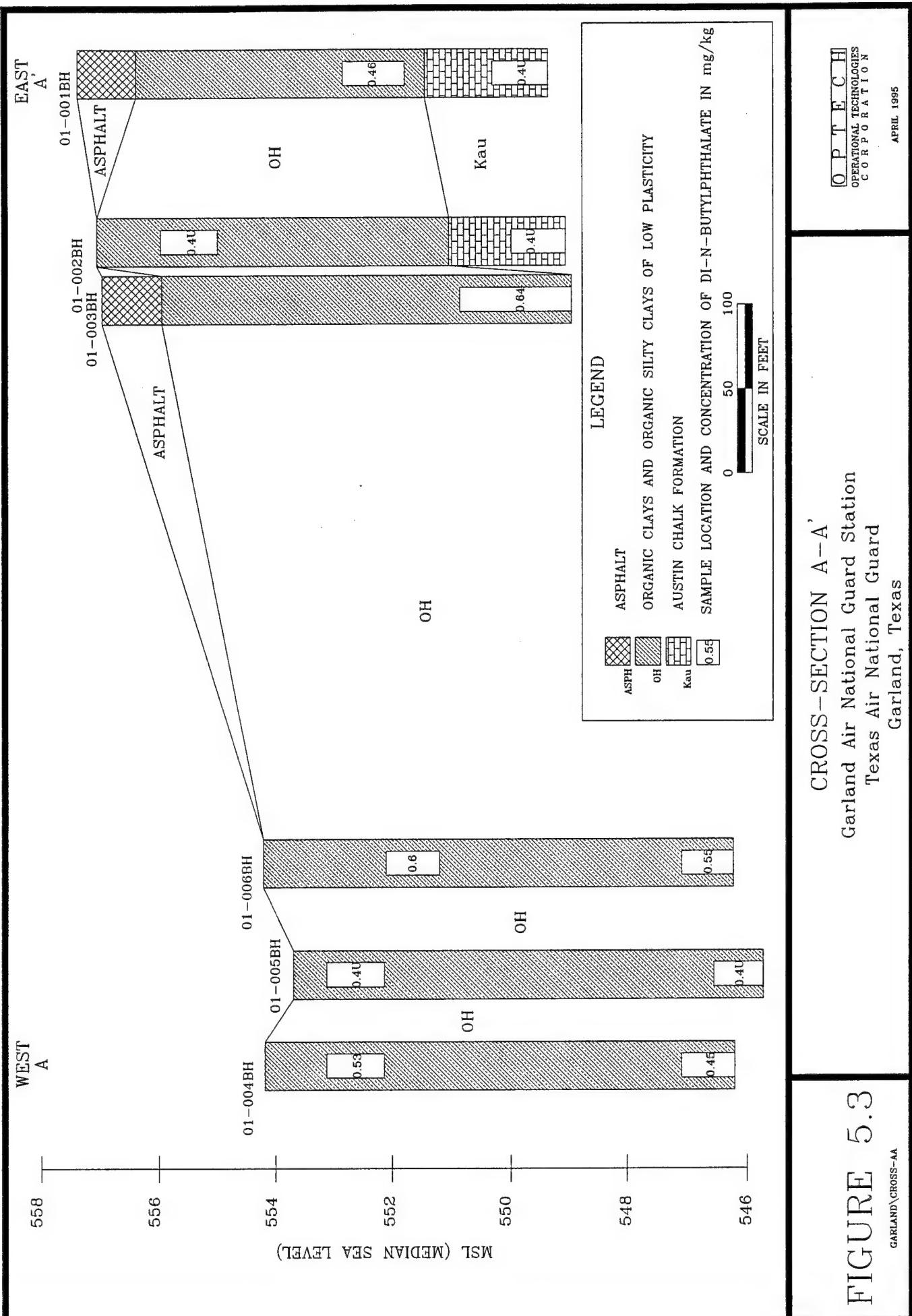
Soil samples were collected from Site No. 1 and submitted for laboratory analysis to confirm the presence or absence of contamination and to provide data needed to reach a decision for the site. Past activities at the site indicated that suspected contamination consists primarily of solvents, waste oil, and fuels. Therefore, samples were submitted for analysis of VOCs, SVOCs, priority pollutant metals, and TPH. Only those parameters, reported at greater than the sample quantification limit, exceeding background and/or ARARs provided by the State of Texas, are addressed in this section.

Contaminants detected were priority pollutant metals, VOCs, and SVOCs. TPH contamination was not detected in any soil boring locations at Site No. 1.

### 5.4.1 Soil Contamination

Evidence of metals contamination is present in soil borings 01-005BH, 01-008BH, and 01-009BH. Cadmium, copper, lead, silver, thallium, and zinc were detected in soil boring 01-005BH at concentrations exceeding the maximum background concentration for these metals.

Cadmium was detected at a concentration of 1.3 mg/kg, copper at 20.0 mg/kg, lead at 26.0 mg/kg, silver at 0.9 mg/kg, thallium at 0.1 mg/kg, and zinc at 51.0 mg/kg in soil sampled



**FIGURE 5.3**  
GARLAND\cROSS-AA

GARLAND\ CROSS-AA

APRIL 1995

卷之三

NORTH  
B'

SOUTH  
B

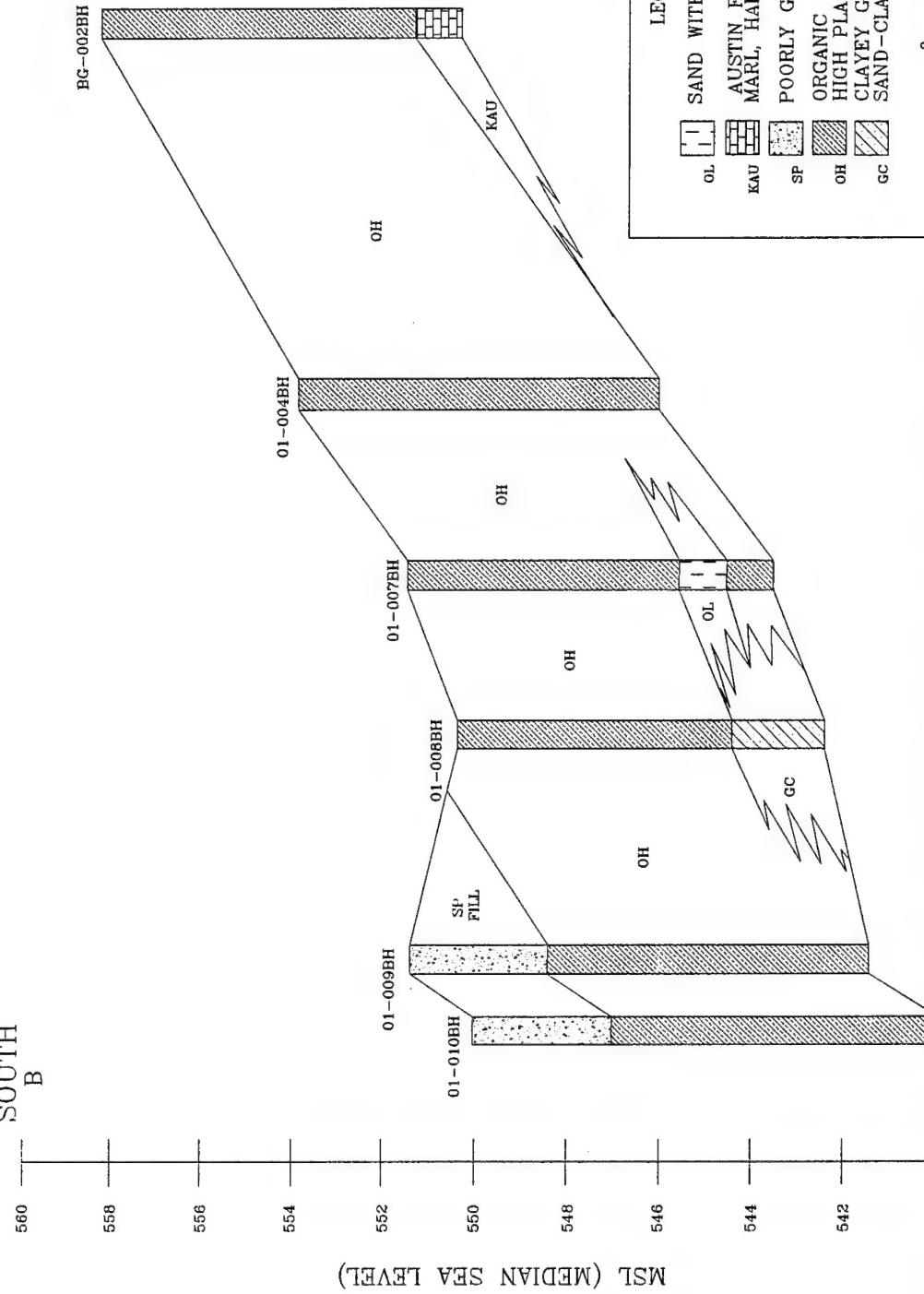


FIGURE 5.4

CROSS-SECTION B-B'  
Garland Air National Guard Station  
Texas Air National Guard  
Garland, Texas

**O P T E C H**  
OPERATIONAL TECHNOLOGIES  
CORPORATION

APRIL 1985

from boring 01-005BH from a depth of 1.0 to 2.0 feet BLS. Copper was detected at a concentration of 23.0 mg/kg in soil sampled from boring 01-008BH from a depth of 7.0 to 8.0 feet BLS. Silver and thallium were detected at concentrations of 0.55 mg/kg and 0.15 mg/kg, respectively, in soil sampled from boring 01-009BH from a depth of 4.0 to 5.0 feet BLS. Although the above concentrations exceeded the maximum background concentrations, these concentrations do not exceed the soil cleanup standards for the State of Texas. In addition, the estimated TCLP results did not exceed the Texas GWP Standards or the Federal toxicity characteristic standards.

VOC contamination was detected in soil sampled from boring 01-008BH from a depth of 2.0 to 3.0 feet BLS. Ethylbenzene, m- and p-xylenes, and o-xylene were detected at concentrations of 0.047 mg/kg, 0.033 mg/kg, and 0.018 mg/kg, respectively. Based on the absence of these constituents in the background borings, the soil near the location of boring 01-008BH appears to be impacted by ethylbenzene and total xylenes. However, these concentrations do not exceed the soil cleanup standards for the State of Texas, nor do the estimated TCLP concentrations exceed the Texas GWP Standards or the Federal toxicity standards.

SVOC contamination was detected in soil sampled from boring 01-004BH from a depth of 1.0 to 2.0 feet BLS. Benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene were detected at concentrations of 0.34 mg/kg, 0.54 mg/kg, 0.44 mg/kg, and 0.48 mg/kg, respectively. Di-n-butylphthalate was detected in soil samples collected from borings 01-001BH, 01-003BH, 01-004BH, and 01-006BH at concentrations ranging from 0.45 to 0.64 mg/kg. These compounds were not detected in the background soil samples. These concentrations do not exceed the Texas SAI regulatory standards established for these contaminants, nor do the estimated TCLP concentrations exceed the Texas GWP or the Federal toxicity standards.

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## **SECTION 6.0 CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 SUMMARY**

An SI was conducted at Site No. 1 located at Garland ANGS, Garland, Texas. A PA conducted in June 1990 identified Site No. 1 as a potentially contaminated disposal and/or spill site. Consequently, it was recommended for further investigation. ANGRC/CEVR authorized OpTech to prepare an SI work plan and conduct the SI at Site No. 1. This investigation was conducted as outlined in the SI Work Plan submitted to ANGRC/CEVR and TNRCC. The field investigation at Site No. 1 commenced on 18 January and was completed on 21 January 1994.

The field investigation at Garland ANGS was accomplished by completing the following tasks:

- Locating underground lines and utilities;
- Drilling 11 soil borings to determine whether contamination exists at the site, and two soil borings to determine background soil conditions;
- Collect 28 soil samples for analysis of VOCs, SVOCs, priority pollutant metals, and TPH; and
- Survey the location and elevation of all soil borings.

### **6.2 CONCLUSIONS**

#### **6.2.1 Soil Contamination**

Evidence of metals contamination is present in soil borings 01-005BH, 01-008BH, and 01-009BH. Cadmium, copper, lead, silver, thallium, and zinc were detected in soil boring 01-005BH from a depth of 1.0 to 2.0 feet BLS at concentrations exceeding the maximum background concentration for these metals. Copper was detected in soil sampled from boring 01-008BH from a depth of 7.0 to 8.0 feet BLS. Silver and thallium were detected in soil sampled from boring 01-009BH from a depth of 4.0 to 5.0 feet BLS.

Although the above concentrations exceeded the maximum background concentrations, these concentrations do not exceed the soil cleanup standards for the State of Texas. In addition, the

estimated TCLP results did not exceed the Texas GWP Standards or the Federal toxicity characteristic standards.

VOC contamination was detected in soil sampled from boring 01-008BH from a depth of 2.0 to 3.0 feet BLS. However, concentrations of ethylbenzene, m- and p-xylenes, and o-xylene detected do not exceed the soil cleanup standards for the State of Texas, nor do the estimated TCLP concentrations exceed the Texas GWP Standards or the Federal toxicity standards.

SVOC contamination (benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene) was detected in soil sampled from boring 01-004BH from a depth of 1.0 to 2.0 feet BLS. Di-n-butylphthalate was detected in soil samples collected from borings 01-001BH, 01-003BH, 01-004BH, and 01-006BH. These compounds were not detected in the background soil samples. These concentrations do not exceed the Texas SAI regulatory standards established for these contaminants, nor do the estimated TCLP concentrations exceed the Texas GWP or the Federal toxicity standards.

Results of analyses indicate concentrations of metals, VOCs and SVOCs were encountered below State cleanup levels. Although the regulatory standards for these contaminants were not exceeded, the vertical and horizontal extent of these constituents have not been fully defined, nor has the presence or absence of groundwater contamination been confirmed. Generally, analytical results indicated contaminant concentrations decreased with depth, which is consistent with the nature of contaminant releases at the site. A groundwater investigation was not conducted at the station as part of the SI since field screening activities and analytical results indicate groundwater contamination at this site is not likely. During the SI, soil borings were drilled to a depth of 12 feet BLS, and groundwater was not encountered. According to a previous geotechnical investigation conducted in December 1991, depth to groundwater at the station was approximately 15 feet BLS.

The nature of station activities precludes the occurrence of soil disturbance by on-site personnel, and the station is completely enclosed by a security fence and not generally accessible to the public. Thus, potential for exposure to any receptors is low. Based on these considerations and the SI analytical results, there is no indication that further soil sampling or a groundwater investigation is warranted.

### **6.3 RECOMMENDATIONS**

Based on the data collected during the SI, no contamination above action levels was identified. Therefore, additional IRP activities are not recommended at Site No. 1.

## **SECTION 7.0 REFERENCES**

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